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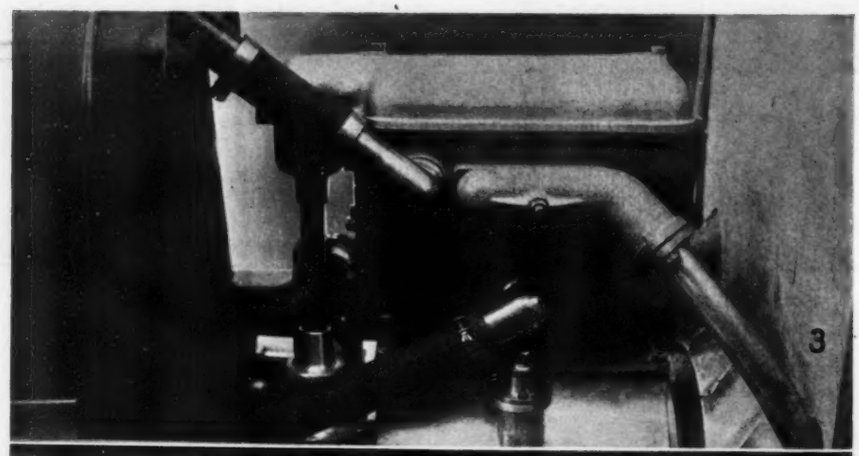
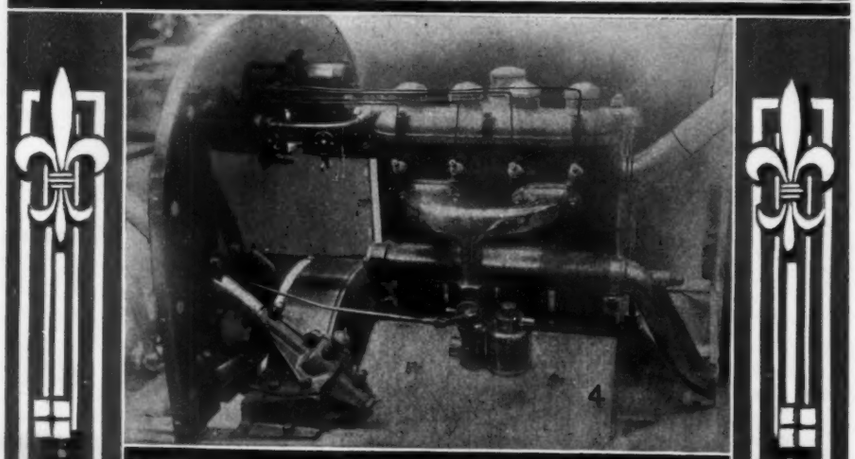
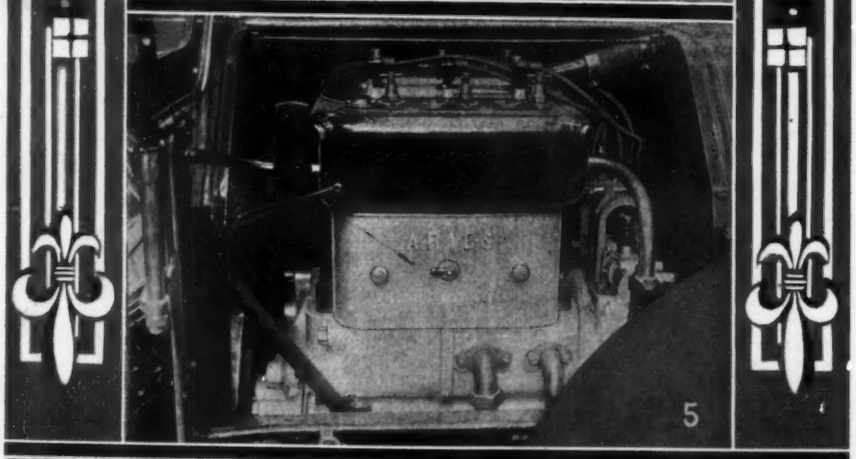
THE AUTOMOBILE

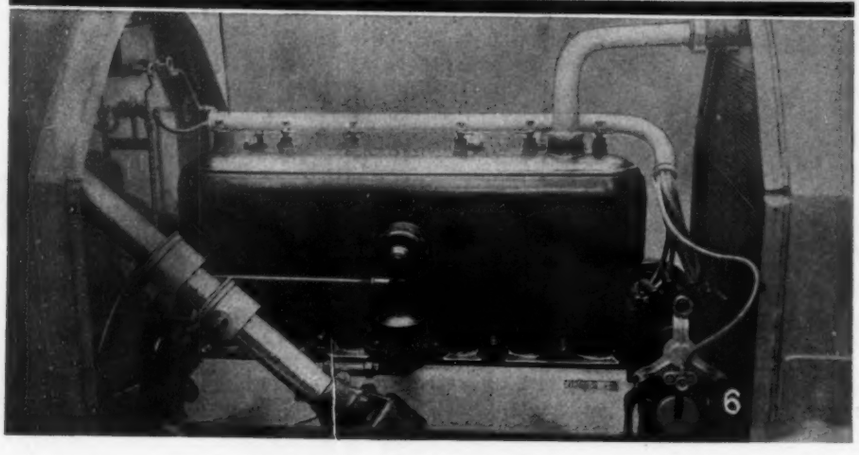
PARIS SALON

PARIS, Dec. 12—The motor at the Paris Salon having the highest ratio of stroke to bore is the new four-cylinder Sizaire-Naudin, the dimensions of which are 2 7-10 by 6 3-5 inches bore and stroke. This gives a ratio of 2.42 to 1. But the long stroke is not the only interesting feature of this motor. The cylinders are a single casting, with valves on op-









posite sides, stems enclosed, and presenting a square box appearance. On the former model, of 2 7-10 by 4 7-10 inches, the valves were superimposed, with a single camshaft. The change to two camshafts has allowed a better position of the sparking plug and an increase of the valve diameter, the area now being 2 1-5 inches. This is probably the largest area of any standard motor on the European market.

It is significant to note that the ball bearings formerly employed on this firm's four-cylinder motors have been dropped for the plain type. The crankshaft is of original design, having only two throws; thus pistons Nos. 1 and 2 are connected up to one crankpin, and are at 180 degrees to pistons 3 and 4. Counterweights are carried on the crankshaft. Tubular connecting rods are employed, and light pressed steel pistons are used. The lower half of the connecting rod bushing is common to two connecting rods. A silent chain is now used for driving the two camshafts. The housing at the forward end of the motor carries two chains, one being on the crankshaft pinion and the two camshaft pinions, and the other taking the drive from the mainshaft to the magneto shaft.

To facilitate timing of the motor, a hole is bored through each pinion and a corresponding hole in the wall of the crank chamber. When the pinions have been locked by a fine bolt passed through these holes, it is only necessary to put on the chain to have the correct timing. Cooling of the motor is by thermo-syphon, but instead of five rows of copper tubes the radiator is now composed of a single row of narrow tubes the full depth of the radiator. Each tube is about 2 1-2 inches in depth, from front to rear. The belt-driven fan is a one-piece aluminum die casting. In place of simple splash lubrication with dippers on the connecting rod ends, as used on the ball-bearing motor, forced feed lubrication is now employed. The pump is driven off the main shaft, drawing its supply of oil from the base chamber and delivering it by internal leads to the two main bearings and through the hollow shaft to the connecting rod ends. The oil filler is on the left-hand or exhaust side of the motor. Attached to the cap is a broad fiber gauge descending into the base, and giving the oil level on being withdrawn. The space between the crank chamber and the side frame is enclosed, and in order to reduce all visible piping to a minimum the intake water

3—Bozier 4-cylinder Monobloc exhaust side
4—Cottereau valveless motor, carbureter side
5—Aries 6-cylinder V-motor in one casting
6—Fiat 6-cylinder motor in one casting. Note entire absence of intake

pipe from the radiator is carried under this plate until it reaches the center of the cylinder bloc; thus there is only a 2-inch length of piping visible.

Although rated at 14 horsepower only, the motor is declared to have given 34 horsepower on bench tests.

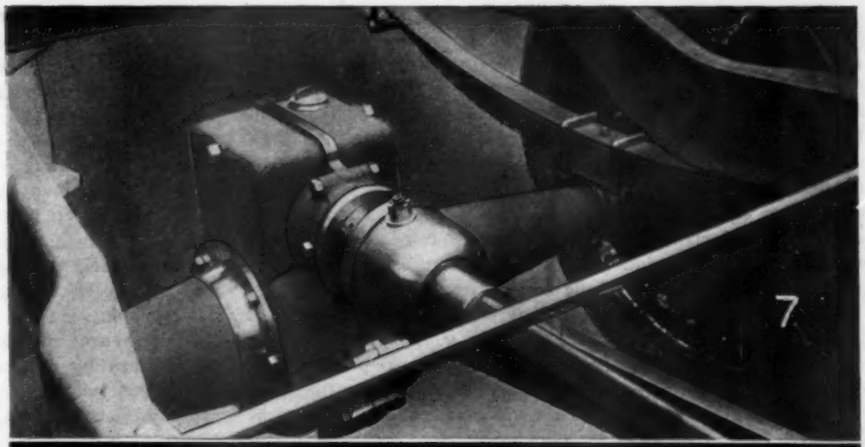
After the Sizaire-Naudin the longest stroke is to be found on the Hispano-Suiza, a motor of 80 by 170 millimeters (3.1 by 6.6 inches bore and stroke) or a ratio of 2.12 to 1. Then follow at least half a dozen makers with a ratio of 2 to 1, prominent among them being Gregoire with 80 by 160 and the Peugeot and Sautter-Harlé with 75 by 150 millimeters. The rest average 1.6 to 1. This is sufficient to prove that the long-stroke motor is accepted unhesitatingly by Continental manufacturers.

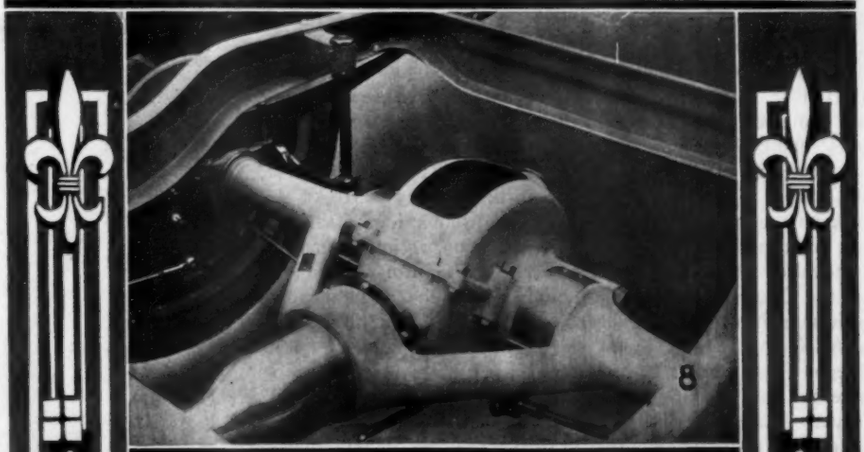
An important feature of the show is the en bloc casting of motors with all water piping and intake and exhaust manifolds. Two years ago the bloc casting was confined to four-cylinder motors of not more than 3 1-4 inches bore.

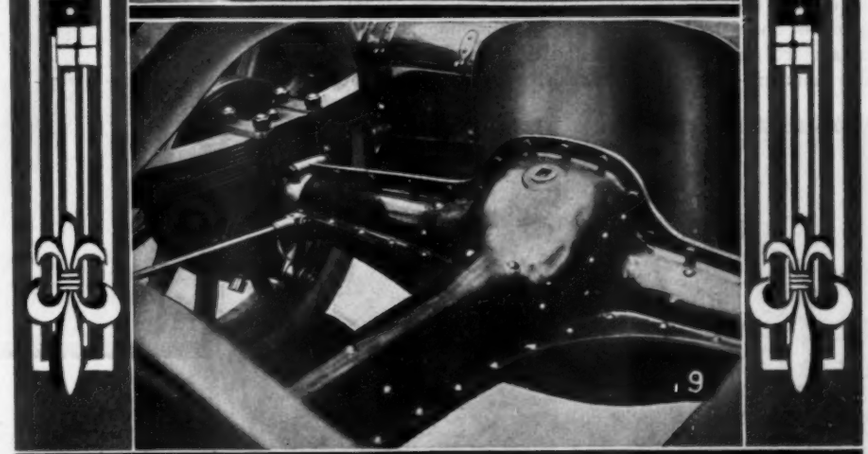
Almost without exception this type of motor is now a single casting, generally with the intake manifold as an integral part, but very frequently with a separate exhaust manifold. But an extension has been made so that this year it is common to find six-cylinders in one casting, some of them having a bore as high as 3 1-2 inches. Examples are to be found on the new Panhard of 80 by 120, the new Fiat of 80 by 130, a Delage of 65 by 125, a new La Buire of 90 by 130 and a Rochet-Schneider of 95 by 130 millimeters bore and stroke. This motor is the largest six-cylinder in one casting to be found in the show.

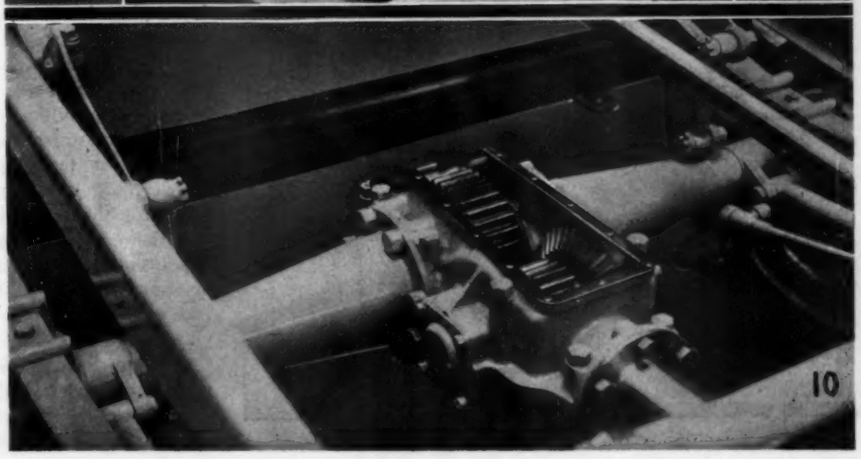
Generally, a single length of piping connects the carbureter with the water-jacketed gas passage cast with the cylinders, and it is a very common practice to place the carbureter on the side opposite to the valves. This is found on the new Rochet-Schneider, the La Buire and on the Fiat. But the Fiat people have gone further than any other maker by abolishing all intake piping.

A remarkably united movement is shown towards carrying the magneto and water pump across the front of the motor, the two being worked off one shaft. This is the system adopted on the six-cylinder Fiat, on the Berliet models, on the Rochet-Schneider, Lorraine-Dietrich, Mors, Sautter Harlé and others. The change appears to have been made with the object of giving greater accessibility to the valves and carbureter.









7—Darracq worm-drive rear construction
8—Rear axle on the Peugeot car
9—Rear axle on Isotta Fraschini car, rear housing and torque rod in two stampings
10—Double reduction rear axle on Lion Peugeot light car

On the smaller models produced by Charron a couple of years ago thermo-syphon circulation was employed with a belt-driven fan in the radiator. This has been abolished for all models. Another firm having made the same change is Bayard-Clement, all the touring cars now having thermo-syphon, no fan, and Renault type of bonnet. Another notable example of the abandonment of the pump is to be found on the new six-cylinder Leon-Bollee. Here the radiator remains the same, and a belt-driven fan is employed to assist the cooling. Although there are plenty of firms having followed the Renault lead in the matter of cooling, very few have made the additional change of placing the radiator back of the motor.

Evidence is not difficult to find of the growing popularity of forced feed lubrication. There are two main systems, one in which the oil is pumped from the crankcase sump to a sight feed or feeds, and then allowed to drip to the main bearings and the connecting rod ends, as on the Charron and the long-stroke Gregoire, or the increasingly popular method of delivering it to all parts under pressure. It is this latter method that has just been adopted by Renault for all 1911 models. The crankshaft is bored to allow the oil to be carried to the connecting rod ends. When this method is adopted all external oil pipes are abolished, examples being the new Sizaire and the latest type of Renault, the oil pump in each case being within the crank-chamber and the oil leads internal. Renault has even abolished the lead to the pressure indicator on the dash by placing a sight tube on the front of the motor. Easy dismounting of the pump has frequently been taken into consideration, as is shown by the removal of this organ from the rear to the front of the camshaft on the Charron models. Although within the crank chamber, provision has generally been made for dismounting the oil pump from the base by a trap in the undershield, as on the Gregoire and the F. L. In a few cases, however, the pump is external, and yet at the base of the crank chamber, as on the Sautter-Harlé six-cylinder model and the Chenard-Walcker new four. The claim made is that in such a position the pump has oil to draw upon until the last drop has been consumed, and that it is more readily examined and dismounted than when within the chamber. There appears to be a tendency, too, to supply oil under pressure to the gearbox and rear axle. This is done on the Hispana-Suiza cars and on the Charron. In this latter case the oil is delivered under pressure to the sight feed, then allowed to drip to the gearbox, from which there is a direct connection through and a constant level maintained with the rear axle. Renault, on the other hand, has preferred to provide for separate lubricating of the gearbox and rear axle by placing large and easily opened fillers on each of these organs. The gearbox filler on the side of the frame member, with a suitable lead, has been abandoned, and the same system has been taken up by Berliet, who has an oil box on the frame with leads to the universal joint, gearbox and rear axle and instructions to fill every day.

Makers are moving rather cautiously toward the adoption of ball-bearing crankshafts. Where they have been taken up it has generally been for small motors, and with the object of gaining space. Thus, Delage has fitted a central ball bearing on his compact six-cylinder because he has not sufficient space for a plain bearing. Darracq has adopted ball bearings for the popular 80 by 120 millimeters model; Sautter-Harlé, a firm producing a small number of very high-grade cars, employs two-ball bearings and a central plain bearing for a six-cylinder motor of 75 by 150 millimeters.

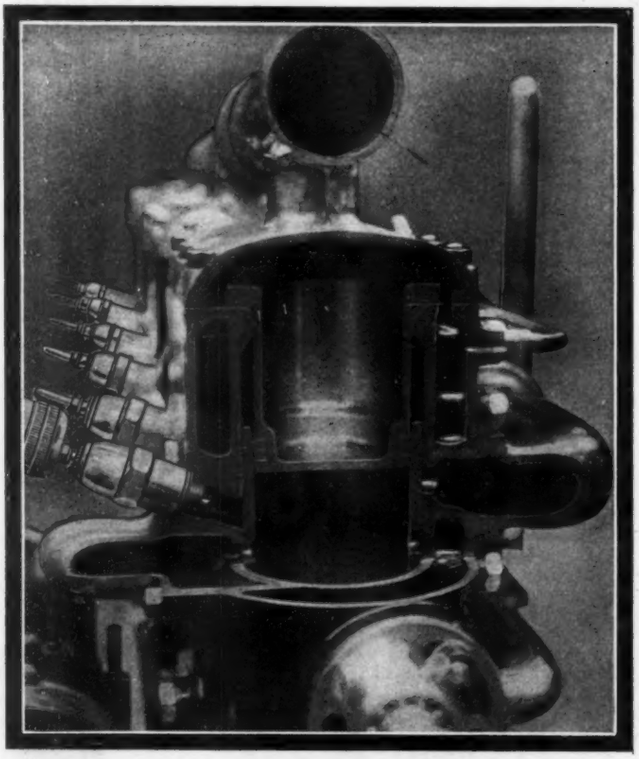


Fig. 11—Section of the Rolland Pilain sleeve-valve motor

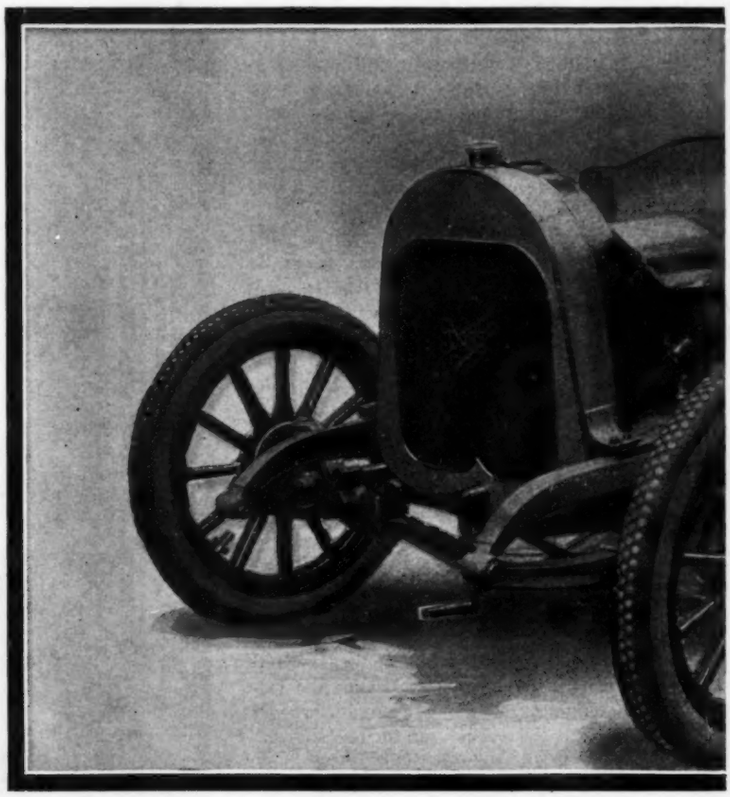


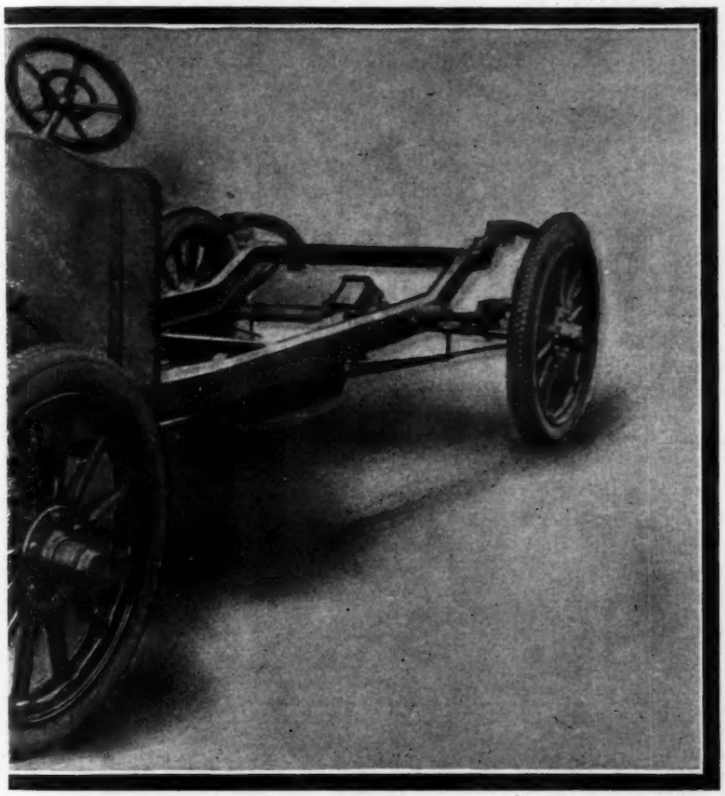
Fig. 12—Bozier four-cylinder light chassis.

Berliet has made an attempt to get away from the poppet-valve motor by adopting piston valves, there being two for each cylinder, one serving for the intake of the charge and the other for the exhaust. The model shown is a four-cylinder in one casting of 3.9 by 5.5 inches bore and stroke. The eight piston valves are connected up to a secondary crankshaft driven by spur gearing off the mainshaft. Everything is enclosed; intake and exhaust manifolds being cast with the cylinders and all water pipes being integral.

A motor on somewhat similar lines has been brought forward by Sautter-Harlé. It is a four-cylinder, two-cycle, with the lower portion of each piston acting as aspirator and compressor. For this purpose it is of greater diameter than the upper

portion. The motor carries eight piston valves, connected up to an auxiliary crankshaft. The charge is aspired through an intake piston valve and on the compression stroke passes through a second piston valve into a compression chamber from which the cylinders are fed. During this stroke the intake valve has, of course, been closed to prevent the charge being driven back into the carbureter. A patented feature of this motor is that the piston valves only operate at half engine speed, whereas poppet valves when employed for two-cycle motors generally work at engine speed.

Considerable interest was shown in a slide valve motor shown by the Rolland-Pilain Company. Within the cylinder is a single sleeve fitted with three deep compression rings, and having two ports, one for the intake and the other for the exhaust. In addition to the two openings in the cylinder wall communicating with the intake and exhaust, there is a third one entering into a pocket carrying the sparking plug. The cylinder head differs



with encased valves and upswept frame

considerably from that employed on the Knight motor. It is really a cylindrical shaped head descending into the body of the cylinder and of slightly less diameter than this latter.

On the Mustad motor, instead of the concentric sleeves of the Knight, there are two semicircular sleeves, serving respectively for the intake and the exhaust, and operated independently.

The Henriot is a rotary-valve motor, an example of which is shown in a small four-cylinder monobloc.

In the Cottereau is to be found a slide valve similar in its underlying principle to the Reno.

The Knight motor was represented by Panhard, Daimler, Minerva and Mercedes, the holders of this license in France, England, Belgium and Germany. At the Panhard stand was a large scale working model with a bore of not less than 34 inches, and which never failed to attract the attention of the visitors.

The present show marks the end of the chain drive. In the treatment of rear axles there is probably more variety than in any other part of the car.

Generally on the French cars the casing of the propeller shaft fulfills the function of torque tube, and this appears to be a solution that is gaining ground. Delahaye has slightly modified his design by using two radius rods from a hanger under the frame member to the axle housing, and a torque rod from the top of the differential housing to a cross member of the frame. The pivoting joints on the rods are enclosed in a leather boot.

Outside the English section of the show, there is only one worm drive shown—it is on the Darracq six-cylinder chassis.

There is a new mechanism giving four direct drives in the Miolans. On the crown wheel are screwed three sets of spur pinions, and on the opposite face a single set of teeth. The driving pinion has a sliding movement on the extremity of its shaft, allowing it to come into engagement with any of the three sets of gears.

German Auto Trade

Teuton is Clannish, but American Maker Has a Field There

GERMANY'S demand for self-propelled vehicles is almost entirely supplied by the home manufacturers. It is worth recording that the Germans have within the last decade wrested the home trade from the French manufacturers. There are some facts which the American who has an eye on the German territory may profit by if they are brought to his notice, facts which are at the present time to his disadvantage. At least twenty German firms producing machines which seem to satisfy the Teuton already have the trade well in hand, inasmuch as they turn out automobiles at prices that suit the people. These firms advertise liberally; and in the event of their having a large output, their selling agents carry a generous stock of accessories. There are hundreds of miles of splendid roads in the Kaiser's dominions, and particularly in the vicinity of Thuringia, where the scenery is of a character to cheer the automobilist's spirits. In spite of this, the question worth while for the American manufacturer to consider is whether the extent and trade of this section of Continental Europe is not such as to warrant him in going to the expense of introducing his machine.

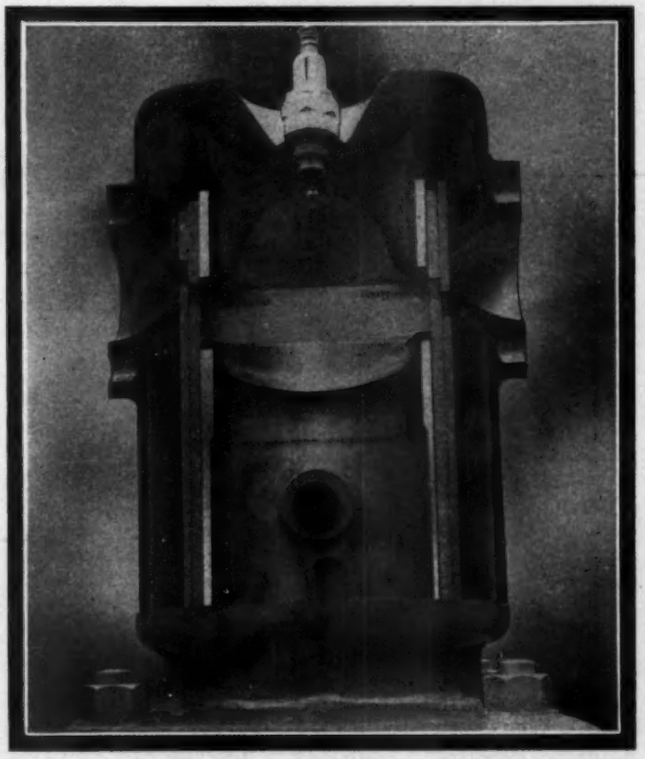


Fig. 13—Working model of the Knight-Panhard motor

Motoring in Winter

THE AUTOIST WHO CONTEMPLATES PACKING HIS CAR AWAY IN COTTON WOOL JUST NOW IS GIVEN SOME COGENT REASONS WHY HE SHOULD NOT DO SO

STIMULATED so that his blood races, skin tingles and appetite is whetted like that of a boy who has enjoyed a daybreak plunge in the ocean, the owner of an automobile who uses it 12 months in the year, particularly in the winter months, has all the advantage in the world over those who lay-up their cars at the first snow flurry.

Winter propounds no problem that cannot be answered by modern automobile construction. There is no intrinsic reason why the autoist may not ride in January as well as in June. In fact, January has a lot of favorable elements that do not exist when the beautiful greenery of the fields and woods seem to be in specially inviting mood. In the first place, a good road is no worse in winter than in summer. If it is good at all it will prove passable in the dead of winter, and very frequently the freezing of a bad road makes it much better for traffic of all kinds, particularly the travel of automobiles.

Given a clear, bracing day, with temperature well below the freezing point, a stout car and a route that passes through a picturesque country, such as the Connecticut hills, the valleys of Jersey or nearly any other favorite summer touring ground, and the result of a day's excursion will not prove disappointing.

Of course, exposure to the elements must be guarded against. No man would think of appearing on Broadway in duck trousers and a Panama in Winter time, and neither would he consider motoring dressed in the same clothes worn in summer. Let him don clothes of sufficient warmth and thickness, paying special attention to feet and legs, and hands and wrists. It is surprising how little extra clothing will be found necessary if the extremities are adequately protected.

During the ride there are a number of simple little expedients, advantage of which may be taken to promote comfort. In the first place, a sensible windshield is a requisite. The motorist who rides behind a good windshield need wear no goggles, because dust is not one of the difficulties that will be encountered in winter. If the day be snowy goggles would prove a distinct disadvantage to the man who drives. The windshield has the further advantage of breaking the force of biting breezes to passengers as well as driver.

A person who lacks actual experience on the roads in mid-Winter might make the mistake of thinking that an undue amount of tire trouble occurs, but such is not the case. In fact, the records tend to show that if anything the percentage of such mishaps is less, if due care is used to keep sufficient pressure within the tubes.

Those who ride in the tonneau will find that if the upper layer of boarding is removed from the flooring over the exhaust pipes the misery of cold feet will be obviated, and when the feet are comfortably warm the whole body is warm.

In dry, cold weather, where the roads are clear, a January ride in a good car is something to dream about. The music of the motor, the tonic of the pure, cold air, the exhilaration of motor motion are all accentuated by the season. To the office man returning to his home in the suburbs such a ride is better than anything ever devised by the learned physicians to bring a healthy appetite. To the invalid such an experience will excel in its effects the action of all the drugs in the Pharmacopeia. To the average owner of an automobile it is simply one more delightful attribute of the car. All told, those who have tried it, and their number is growing by leaps and bounds, unite in paraphrasing Sancho Panza by saying, "God bless the man who invented January—and the automobile."

Brooklands as a Testing Ground—Besides the regular meetings that take place about every two months at Brooklands Autodrome the track can be used for speed tests for manufacturers and those members of the Brooklands Automobile Club who are desirous of indulging in bursts of speed that are impossible on the road for obvious reasons.

The Cost of a Tour

BEING THE FINAL INSTALLMENT OF THE LOG OF A LEISURELY SUMMER AUTOMOBILE TRIP FROM THE JERSEYS TO THE FAR WEST AND RETURN

THE completion of the initial installment of this log of a long and leisurely automobile journey across country from New Jersey to Montana left the travelers in Chicago, where they arrived on July 1, after having been on the road for nine days. They had covered 1,122 miles, having used 154 gallons of gasoline—7 1-4 miles to the gallon. The log continues:

July 2. Scoured Chicago for information about the Western roads and for maps of the States through which we intended to travel. These helped us in the general direction but not with the roads. Left Chicago late in the afternoon. We followed a beautiful road through Elgin to Rockford, Ill. Ran into a thunderstorm later in the evening. Had more trouble with the chains. 95 miles.

July 3. Discovered that a number of the balls and part of the inside ring of the thrust bearing in one of the front hubs were smashed. Telephoned immediately to the Fiat Repair Company in Chicago, who sent a messenger to Rockford that afternoon with a new part.

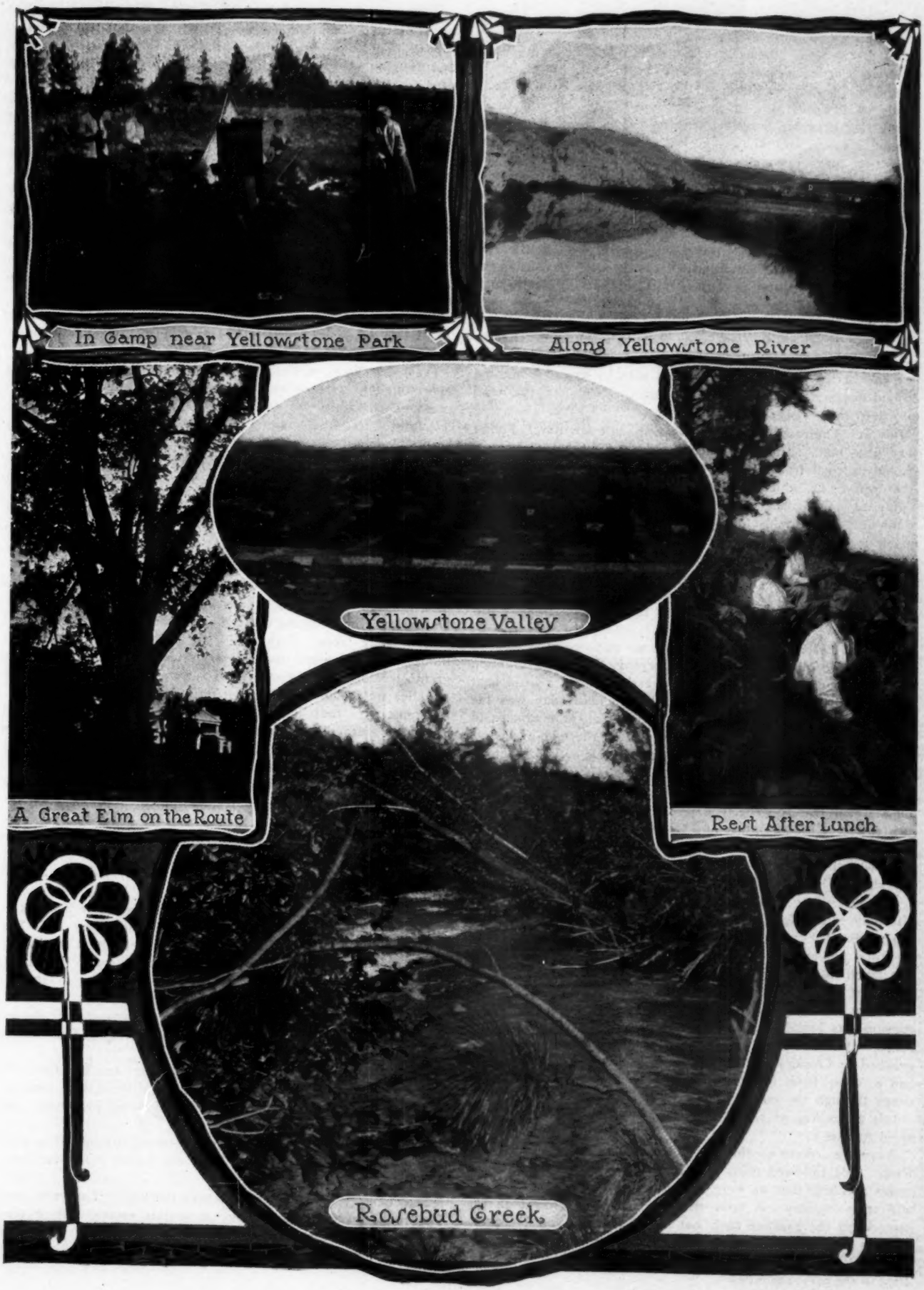
July 4. Went on over a very sandy and hilly road to Clinton, Iowa. Stopped at Sterling for a little while to have lunch. Crossed the Mississippi at Lyons, going South a short way to Clinton. Some of us had never seen this river before and admired it very much. The scenery for the whole day had been very beautiful. 87 miles.

July 5 and 6. Delayed in Clinton by rain.

July 7. Finding it all but impossible to drive an automobile through the Iowa mud, we ran the machine on a freight car and went across the State by rail to Sioux City on the Missouri river, which is at that point the boundary between Iowa and South Dakota.

July 8 to 11. Remained in Sioux City on account of rains and floods. This town is built on the side of a rather steep hill, and by climbing this one can obtain a beautiful view of the whole place with the river in the distance.

July 12. Made a desperate attempt to get out of the flooded district. We ploughed through a continued mudhole for three or


In Camp near Yellowstone Park
Along Yellowstone River
Yellowstone Valley
A Great Elm on the Route
Rest After Lunch
Rosebud Creek

four miles, only to find all bridges and culverts washed away. It was all we could do to get back to the city and we were very much discouraged. Leaving the car and chauffeur in Sioux City, we boarded a Burlington train for Billings, Mont.

July 14. Arrived in Billings.

July 16. Two of us went back to Sioux City.

July 19. Provided ourselves with a block and tackle, 100 feet of rope, a shovel and an axe and left Sioux City in the machine. Excepting for occasional mudholes, the roads were not as bad as we expected. Time and again we would make a vain attempt to dash through a mudhole, but would get hopelessly fast in the center of it. It usually took about two hours to get out. We would jack up the rear wheels as best we could and put planks under them. Sometimes the car could get out without the help of the block and tackle, but we usually had to drive a stake in the center of the road and fasten the tackle to it. Went through Akron and Sioux Centre to Rock Rapid, Iowa, where we spent the night. Two punctures. 80 miles.

July 20. Went on through Sioux Falls to Farmers, S. D. The roads were the sauce. Were fast in the mud four times. This day we carried two-inch planks along with us to avoid hunting around for some. Once the car slipped entirely off the road into deep mud. 100 miles.

July 21. The roads were better than the last few days. Found very little mud. The only difficulty we had was in crossing a graded railroad track. Went through Mitchell and Redfield to Aberdeen, S. D., which is quite a large town. 140 miles.

July 22. The roads continued good except for an occasional mudhole. In the midst of one of these we found a small car unable to move. We helped it out, and, as we did not know the way, followed it to Mowbridge, S. D. The roads were now changing from roads to trails which were good but did not permit of fast time. In many places the grass on each side was as tall as the car. Went by way of Ipswich and Jacksonville. 105 miles.

July 23. Before leaving Mowbridge we employed the services of a native to guide us across the Cheyenne Indian Reservation which we were about to cross. Drove the car on a little boat which ferried us over the Missouri River. This day was the hardest one we had so far. There were frequent mudholes to bother us. I thought one of them would be the end of everything. It was impossible to raise the rear wheels by jacks, but we finally thought of placing a log behind the wheels and using a strong piece of wood as a lever. We went down into a brook, but the bank was so steep that the car could not ascend it by its own power. Crossed prairie and bad lands all day and were very fortunate to have the services of a guide. It was getting dark when we came to the cabin of a rancher who very kindly kept us overnight. Only a trail all the way. 92 miles.

July 24. Went on to Lemmon, S. D., for dinner and in the afternoon to a little place in North Dakota called Scranton. Had fair roads all the way except for the proverbial mudholes. These we could not escape. They delayed us for hours. The country was much the same, just prairie. One puncture. 125 miles.

July 25. Went on through Bowman, where we had breakfast. almost to Marmouth, N. D. Here a thrust bearing in the transmission was broken. So we walked into Marmouth and sent a couple of teams out after the machine. Immediately telegraphed to Chicago for a new part, which was not in stock and had to come from New York. The roads were very hilly and rough through the same kind of country. 60 miles.

July 26 to August 1. In Marmouth, N. D. New bearing arrived August 1.

August 2. Went on through Baker and Ismee to the Powder River. We followed trails wherever possible, but they were so rough and hilly that we were forced very often to abandon them and cross country. A rock sticking up in the road took the petcock off the gasoline tank, but we fortunately had a cock to hold in the gasoline. As it was dark when we came to the Powder River and we could not see to cross it, we built a fire and slept in the car. 100 miles.

August 3. Arrived safely in Miles City, Mont., where we had breakfast and fixed the gasoline tank. Went on to Forsythe, Mont. The roads were bad beyond description. They were hilly and rough and full of mudholes caused by flooded irrigating ditches. Went very slowly all the way. 80 miles.

August 4. Went on to Huntley, Mont. The country and roads were the same. One hill was so rough and steep that it was out of the question to climb it. We therefore tried to go around it. In attempting this we encountered a graded railroad track. We got on top of this but were stuck there, for the rear wheels kicked out the cinders so as to let the flywheel down on one of the rails. We were now in a bad way as a train might happen along any minute. We jacked up the wheels, putting rocks and planks and anything we could find under them, until the whole car was raised up sufficiently to clear the rail. Then the chauffeur managed to run the car off and down the other side. There were difficulties in store for us every foot of the way. 125 miles.

August 5. Made short run from Huntley to Billings, Mont. The roads were very good and the country beautiful. No trouble of any kind. 15 miles.

Freehold, N. J., to Billings, Mont., by the route we took is approximately 2,176 miles. We covered it in 20 running days; average, 108.8 miles per day.

August 6 to 22. Remained in and about Billings, taking many beautiful drives through the country. One trip took almost to Yellowstone Park. We followed the Yellowstone River through Park City to Columbus, where we had lunch. Here the river was crossed and the Stillwater River followed through Absorikee. over the most beautiful country imaginable, with snow-capped mountains on three sides. On August 19 we freighted the machine over the bad lands to Jamestown, N. D., going by train ourselves.

August 24. Left Jamestown in the rain and went over a fine road through Valley City, where we had lunch, to Fargo, N. D. During the whole day we crossed one continuous wheat field and passed many lakes. Both fields and lakes were covered with thousands of snipe and duck. Every few miles was a tremendous grain elevator. Near Fargo the road was very muddy and for 15 miles we ploughed through it on low gear. 125 miles.

August 25. Left Fargo at noon and followed a fine road through Barnesville to Fergus Falls, Minn. This whole country is a mass of small lakes. The road winds between them, giving beautiful views. One puncture. 150 miles.

August 26. Beautiful run over fine roads through Alexandria to St. Cloud, Minn. The country was much the same as on the day before. 160 miles.

August 27. Good road to Minneapolis, where we arrived in time for dinner.

August 28 and 29. In Minneapolis. Beautiful drives around lakes to St. Paul.

August 30. This part of the country is made like a checkerboard by the roads which are about three miles apart. We lost our way often but could keep the general direction. Crossed the Mississippi and followed it some distance through Faribault, where we had lunch. Went on through beautiful country to Cresco, Iowa. 170 miles.

August 31. The roads were slippery on account of rain, but we went without accident through Independence and Delwein to Dubuque, Iowa. 150 miles.

September 1. Proceeded through Freeport to Rockford, Ill. The roads were very poor, full of rocks and steep hills, some of which it was all the car could do to climb on low gear. 100 miles.

September 2. Beautiful macadam road through Elgin to Chicago, where we arrived in time for lunch. One puncture. 95 miles.

September 3. Across the Kankakee swamps to Lafayette, Ind. The roads were wonderful except in this swamp. Here they were so slippery that we covered the whole distance at about five miles an hour. Blew out a tire that lasted from New York. 125 miles.

September 4. To Indianapolis in time for dinner. The road all the way was a regular race course. 75 miles.

September 5. Went on through Richmond and Dayton to Columbus, Ohio. We followed the National Road and had no trouble. 176 miles.

September 6. Still on National Road through Zanesville to Wheeling, W. Va. Road still good, but the last few miles brought up to the edge of the Allegheny Mountains. 120 miles.

September 7. Arrived in Pittsburgh in time for lunch. The roads were very hilly and covered with high water bars. On account of the small clearance of the car these gave a lot of trouble. 75 miles.

September 8. Leaving Pittsburgh in the afternoon we made a short run to Johnstown. I will not attempt to describe the hills in Pennsylvania. 79 miles.

September 9. Went on through Bedford Springs to Chambersburg. Roads same as on preceding day. 96 miles.

September 10. Through Gettysburg, where we spent an hour on the battlefield, and York to Lancaster. Roads good. 78 miles.

September 11. By way of Philadelphia and Camden to Freehold, N. J., the place of starting. 135 miles.

Jamestown, N. D., to Freehold, N. J., by our route is 1,980 miles, which distance we covered in 17 working days. Average. 116 miles per day. During the entire trip we covered 4,309 miles in 39 traveling days. Average, 110 miles per day. This mileage does not include numerous short rides taken in the West, nor the 900 miles over which the car was freighted. These would bring the total mileage up to some 5,700 miles. This, of course, is approximate.

Altogether we had about 10 punctures and blowouts. Found the pneumatic tires very satisfactory. Much of the success of the tour was due to the untiring efforts and care of the chauffeur, Louis Colauer.

EXPENSE ACCOUNT.

June	22	Baggage expressed to Chicago	$4.60
"	"	Ferry fares	1.50
"	"	Lunch in New York	5.40
"	"	Sundries	1.25
"	23	10 gal. gasoline at 20c.	2.00
"	"	3 quarts oil at 25c.	.75
"	"	Storage for car	1.00
"	"	Chauffeur's expenses	2.25
"	"	Lunch	3.85
"	"	Blue Book	2.75
"	"	Chauffeur's expenses	1.10
"	"	Supper	3.80
"	"	Sundries	1.20
"	24	Breakfast	3.65
"	"	Tail lamp	3.50
"	"	20 gal. gasoline	4.00
"	"	Storage	1.00
"	"	Hotel bill	18.00
"	"	Lunch	3.40
"	"	Supper	3.25
"	"	Sundries	.82
"	"	Oil	1.90
"	25	Gasoline	2.60
"	"	Storage	1.00
"	"	Oil	2.60
"	"	Chauffeur's expenses	.90
"	"	Hotel bill	11.00
"	"	Meals	11.00
"	"	Sundries	2.01
"	26	Gasoline	2.10
"	"	Oil	1.20
"	"	Garage expenses	2.50
"	"	Chauffeur's expenses	1.00
"	"	Hotel bill	14.80
"	"	Supper	5.00
"	"	Sundries	.83
"	27	Tires	41.35
"	"	Meals	6.60
"	"	Sundries	7.10
"	28	Meals	5.35
"	"	Gasoline	3.35
"	"	Oil	1.85
"	"	Storage	1.50
"	"	Washing car	1.00
"	"	Hotel bill	33.60
"	"	Sundries	3.40
"	"	Sundries	.45
"	29	Gasoline	2.34
"	"	Oil	.75
"	"	Hotel bill	15.50
"	"	Gasoline	2.95
"	"	Sundries	2.23
"	30	Oil	1.30
"	"	Storage	.75
"	"	Hotel bill	10.00
"	"	Dinner	3.25
"	"	Gasoline	1.50
"	"	Sundries	.95
July	1	Hotel bill	10.50
"	"	Garage bill	2.95
"	"	Dinner	3.00
"	"	Supper	2.30
"	"	Garage bill	3.50
"	"	Sundries	.60
"	2	Meals	11.85
"	"	Hotel bill	19.00
"	"	Garage bill	6.50
"	"	One shoe	27.80
"	"	Maps	4.00
"	"	Chauffeur's expenses	1.50
"	"	Sundries	8.35
"	3	Hotel bill	31.50
"	"	Gasoline	2.60
"	"	Tire lugs	3.00
"	"	Vulcanizing	1.10
"	"	Oil	.90
"	"	Storage	1.00
"	"	1 bearing and 1 speedometer cable	14.90
"	"	Expenses of messenger	4.50
"	"	Sundries	1.45
"	7	Freighting auto	30.00
"	"	Garage bill	1.74
"	"	Railroad tickets	58.24
"	"	Hotel bill	74.98
"	"	Sundries	7.05
"	8	Meals	8.65
"	"	Expressing baggage	17.40
"	"	Sundries	8.95
"	9	Meals	7.70
"	"	Chauffeur's expenses	2.00
"	"	Sundries	2.40
"	10	Meals	10.80
"	"	To chauffeur	10.00
"	"	Meals	6.85
"	"	Auto supplies	1.83
"	"	Sundries	3.75
"	11	Meals	9.90
"	"	Gasoline	3.00
"	"	1 pair Chains	11.00
"	"	Gasoline	1.05
"	"	Storage	1.50
"	"	Axe and shovel	2.00
"	"	Railroad fare	124.50
"	"	Hotel bill	28.00
"	"	To chauffeur	40.00
"	"	Sundries	4.30
"	12	Meals	11.15
"	"	Hotel bill	7.50
"	"	Pullman tickets	25.50
"	"	Sundries	1.55
"	13	Meals	9.75
"	"	Sundries	.75
"	14	Breakfast	2.50
"	"	Sundries	6.00
			$981.49
Aug.	18	Meals	4.15
"	19	Meals	9.55
"	"	Garage bill	14.11
"	"	Hotel bill	39.00
"	"	Railroad tickets	108.00
"	"	To chauffeur	9.00
"	"	Sundries	.85
"	20	Breakfast and sundries	3.10
"	22	Sundries	5.00
"	23	Freighting car	95.00
"	24	Garage bill	7.00
"	"	Expressing trunks	15.40
"	"	Hotel bill	45.00
"	"	Dinner	2.50
"	"	To chauffeur	9.00
"	25	Hotel and garage bills	18.75
"	"	Dinner and sundries	3.60
"	26	Hotel and garage bills	15.35
"	"	Dinner	2.50
"	27	Hotel and garage bills	8.90
"	29	Sundries	2.00
"	30	Hotel bill	82.55
"	"	Garage bill	8.55
"	"	Dinner	2.60
"	"	To chauffeur	10.00
"	"	Supper	1.50
"	31	Hotel and garage bills	10.90
"	"	Dinner and to chauffeur	5.50
Sept.	1	Hotel and garage bills	16.05
"	"	Meals	4.25
"	2	Hotel and garage bills	12.18
"	"	Supper	5.50
"	3	Meals	10.00
"	"	Hotel and garage bills	17.30
"	"	New shoe	17.70
"	4	Hotel and garage bills	11.40
"	"	Sundries	1.20
"	"	New shoe	34.70
"	"	Garage bill	2.35
"	5	Hotel and garage bills	29.00
"	6	Hotel and garage bills	18.20
"	"	Meals	6.60
"	"	Sundries	7.00
"	7	Meals	9.00
"	"	Garage bill and to chauffeur	9.25
"	8	Hotel and garage bills	14.00
"	"	Meals	6.00
"	"	Sundries	4.05
"	9	Hotel and garage bills	13.54
"	"	Meals	7.75
"	10	Hotel and garage bills	17.50
"	11	Hotel and garage bills	22.59
"	"	Dinner	4.50
			$1807.55
		Approximate expenses from July 14 to Aug. 18	1700.00
			$3507.55

In the Building of Balloons

PROFESSOR WILLIAM B. ENNIS PRESENTS TECHNICAL INFORMATION UPON AERIAL SUBJECTS FOR THE PURPOSE OF CLEARING UP SOME OF THE PROBLEMS THAT DEFY SOLUTION BY A CUT-AND-TRY METHOD—FIRST INSTALLMENT

WHILE one group of men traveled from Paris to London faster than the trip had ever before been made, and that through the air, six other men started on the world's record flight of 1,000 miles in three days over the Atlantic Ocean. These reached no destination and for the most part held to no course. Yet no one would now venture to say that within a year or two, with more adequate preparation and sounder planning, some more successful explorer—or even these same men—may not accomplish what has this time failed of success: in spite of the assertion, made not many months back, that before men would travel through the air at pleasure there must first be discovered either some new metal or some new force.

Aerial Statics

A cubical block of wood measuring 12 inches on a side floats on water because it is lighter than water; it weighs (yellow pine) 38 pounds, while the same volume of water weighs 62.4 pounds. Any substance weighing more than 62.4 pounds per cubic foot would sink in water. If our block of wood be drilled (Fig. 1) and *lead* poured in, the total size of wood and lead block being kept constantly at 1 cubic foot, the block will sink as soon as its total weight exceeds 62.4 pounds. Ignoring the wood removed by boring (as compared with the lead which replaces it, an insignificant amount), the weight of lead plugged in may reach $62.4 - 38 = 24.4$ pounds before the block will sink. This figure, 24.4 pounds, then represents the *maximum buoyant power* of a cubic foot of *wood in water*. If any weight *less* than this is added to that of the wood, the block will float, projecting above the water surface more or less, according to the amount of weight buoyed up (Fig. 2). It will not rise entirely from the water because to do this it would need to be *lighter*, not only than water, but *than air*.

Buoyancy in Air.—There are *gases* lighter than air, among the best known being coal gas and hydrogen. A bubble of any of these gases if isolated from surrounding air cannot sink, but must rise. At equal pressure and temperature hydrogen is fourteen and one-half times lighter than air. If a bubble of hydrogen be liberated in the atmosphere it must continually rise just as wood immersed in water would rise when set free. But the wood will stop when it reaches the surface of the water, while there is no sufficient reason to suppose that the gas bubble will stop. The hydrogen bubble can be made to remain stationary in equilibrium if it be weighted down with something of thirteen and one-half times its own weight (Fig. 3). (Strictly speaking, it will still rise slowly because that additional something would itself displace some additional air; but if the added weight is a solid body its own buoyancy in air is practically negligible.) We then have our first principle: At the same pressure and temperature, a confined volume of hydrogen has a maximum lifting power in air of thirteen and one-half times its own weight, the substance considered to be lifted including the containing vessel for the hydrogen itself.

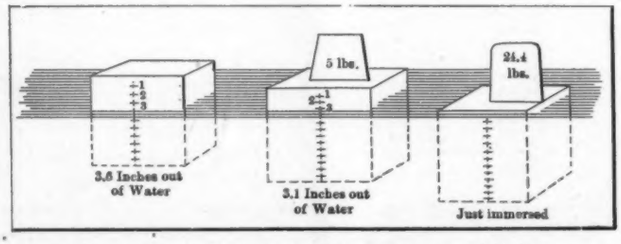


Fig. 2—Illustrating the relating buoyancy of bodies

Variations in Buoyancy.—The two fundamental equations

$$P_h V_h = R_h T_h; \quad P_a V_a = R_a T_a;$$

in which P = pressure in pounds per square inch, measured above a perfect vacuum.

V = volume of one pound of gas in cubic feet,

T = Fahrenheit temperature + 460,

R = a constant, having the value 5.347 for hydrogen and 0.3706 for air, and the subscripts h and a refer respectively to hydrogen and air; enable us to determine the relative densities

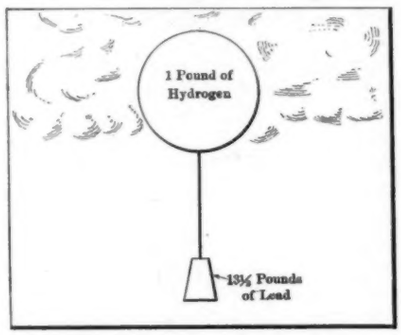


Fig. 3—Indicating the lifting power of hydrogen in air

(weights per cubic foot $= \frac{1}{V}$), and consequently the buoyant power, of the hydrogen when it and the air are at different pressures and temperatures; for we have, D standing for the weight of a cubic foot in pounds,

$$D_h = \frac{P_h}{5.347\ T_h} \text{ and } D_a = \frac{P_a}{0.3706\ T_a} \qquad \text{(Equations A)},$$

and

$$P_h = 5.347\ T_h D_h, \quad P_a = 0.3706\ T_a D_a \qquad \text{(Equations B)}.$$

Thus, let a gas bag or envelope, at sea level, where the atmospheric pressure is 14.7 pounds per square inch and the air temperature at the moment is 32° F., be filled with hydrogen at a gauge pressure of 2 pounds per square inch and a temperature of 60° F. Then,

$$P_h = 14.7 + 2.0 = 16.7 \qquad T_h = 60 + 460 = 520$$
$$P_a = 14.7 \qquad T_a = 32 + 460 = 492,$$

and

$$D_h = 16.7 \div (5.347 \times 520) = 0.00604,$$
$$D_a = 14.7 \div (0.3706 \times 492) = 0.0806;$$

So that the lifting power of each cubic foot of hydrogen under these conditions is

$$0.0806 - 0.00604 = 0.07456 \text{ pounds.}$$

If the gas bag, car, etc., weigh 2,000 pounds, we must have

$$2{,}000 \div 0.07456 = \text{about } 26{,}820 \text{ cubic feet of hydrogen.}$$

Altitude, Pressure and Temperature.—The pressure of gas in the balloon is usually kept down (especially at starting) to a very small fraction of a pound. Its temperature may be about the same as that of the air. The balloon is always provided with excess of lifting power above its load when completely manned. This excess buoyant power must be counteracted while the bag is in the hangar by the use of extra ballast or holding-down ropes (Fig. 4). When liberated from these the great gas bag at once flies aloft. To bring it to equilibrium on an even keel somewhere in the air there must be a readjustment of pressures and temperatures. The normal pressure of the atmosphere

decreases about 1 *pound, for each* 2,000 *feet of ascent*;* its weight per cubic foot, assuming the temperature to remain constant, is accordingly decreased about $\frac{1}{14.7} = \frac{2}{29}$ for this amount of ascent; but this decrease is somewhat offset because of the fact that the temperature of the air decreases as we ascend. For moderate elevations, however, the temperature does not change greatly. This decreased density of the air with elevation attained tends, of course, to decrease the buoyant power of the balloon.

Meanwhile, the reduced external pressure has permitted the gas bag to expand somewhat, as a result of which the pressure of the hydrogen falls, its weight per cubic foot of space occupied slightly decreases and (which is most important) the strain on the gas bag, on account of the now greater difference between internal and external pressure, has decidedly increased. Further, the sun shining on the heat-absorbent material of the gas bag may increase the temperature of its contents above that of the surrounding non-absorbent atmosphere, again increasing the gas pressure, while possibly decreasing the weight per cubic foot of space occupied and thus tending to increase the buoyant power. Will this tendency suffice to offset the change in density of the air? Here, in a word, is the whole problem of what may be called BALLOON REGULATION. Air has no *surface,* like water, limiting the upward rise of the gas bubble. We must find a means of controlling our vertical position irrespective of pressure and temperature conditions.

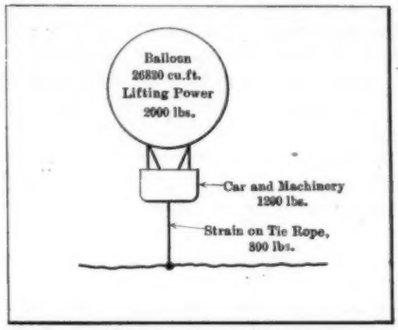


Fig. 4—Depicting the strain on tie rope under given conditions

Illustration.—Suppose under the pressure and temperature conditions previously considered a margin of lifting power for ascent is obtained by keeping the total load on our 26,820-cubic foot balloon down to 1,900 pounds instead of the 2,000 pounds which it is just able to support, and suppose it to be desired that we maintain an elevation of 1,000 feet with air at 20° F., gas at 70° F. At the required elevation,

$$P_a = 14.7 - 0.5 = 14.2, \quad T_a = 20 + 460 = 480,$$
$$T_h = 70 + 460 = 530.$$

Let us assume in advance that the decreased external pressure, coupled with any change which may take place in internal pressure, will expand the gas bag and its contents by 1 per cent., so that

$$D_h = 0.00604 \div 1.01 = 0.00598,$$

while from Equation A

$$D_a = 0.3706 \times 480 \times 14.2 = 0.0798.$$

The buoyant power per cubic foot of gas is now

$$0.0798 - 0.00598 = 0.07382 \text{ pound;}$$

or for the whole balloon,

$$26{,}820 \times 1.01 \times 0.07382 = 1{,}990 \text{ pounds.}$$

Since the load is only 1,900 pounds, we still have a surplus of lifting power, and the balloon will continue to ascend. It will rise until the buoyant power per cubic foot of gas becomes (assuming no further stretching of the bag to take place)

$$1{,}900 \div (26{,}820 \times 1.01) = 0.0701 \text{ pounds;}$$

And if we assume (merely for the purpose in hand and not in accordance with the necessary facts) bag expansion and atmospheric temperature to be the same for all altitudes, the rising will continue until the weight of a cubic foot of air becomes

$$0.0701 + 0.00598 = 0.07608 \text{ pound}$$

at a pressure of (Equation B)

$$0.07608 \times 0.3706 \times 480 = 13.6 \text{ pounds per square inch,}$$

when the altitude is

$$2{,}000\ (14.7 - 13.6) = 2{,}200 \text{ feet.}$$

The pressure in the gas bag is now, from Equation B,

$$5.347 \times 530 \times 0.00598 = 16.9 \text{ pounds per square inch.}$$

The net bursting pressure (difference between internal and external pressures) is $16.9 - 13.6 = 3.3$ pounds, whereas at starting it was only 2 pounds. The *stress on a linear inch of fabric* (in a cylindrical balloon) is obtained by *multiplying this net pressure by half the diameter in inches.* Suppose the balloon to be 20 feet in diameter. The stress on each inch of fabric, tending to split it longitudinally, is $2 \times \frac{240}{2} = 240$ pounds at sea level and $3.3 \times \frac{240}{2} = 396$ pounds at our 2,200-foot elevation.

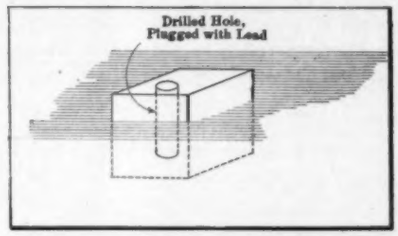


Fig. 1—Presenting a problem in buoyancy, indicating effect of loading a buoyant body

No such stresses are actually attained in fabricated envelopes, as the pressures are kept low; but the variations in stress with altitude are serious, and with such fabrics as are now available a stress even as low as 40 pounds per linear inch (with the diameter in our illustration, equivalent to a pressure of $40 \div \frac{240}{2} = \frac{1}{3}$ pound per square inch) would leave little margin of safety.

Methods for Altitude Control

First Method: By Venting Gas.—Our balloon is now in equilibrium at an altitude of 2,200 feet, although in order that we may encounter more favorable wind conditions we prefer a 1,000-foot elevation. In addition, it is dangerously stressed. In some way we must quickly bring about a new equilibrium condition. The only way at once apparent is to allow some of the gas to escape. We wish the buoyant power to be exactly 1,900 pounds at a 1,000-foot elevation. To compute the amount of gas to be allowed to escape in order to accomplish our pur-

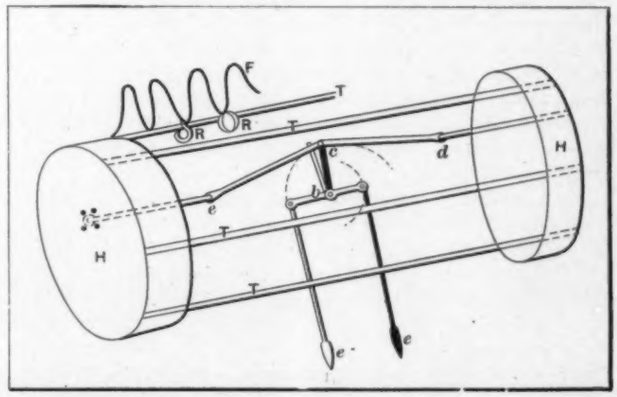


Fig. 5—Scheme for varying the density of the gas bag by changing the volume within

*This rough figure has been used for simplicity in the balance of the calculations. More accurately, the relation of altitude to pressure is about as follows:

Altitude in miles	Atmospheric pressure pounds per square inch
0	14.7
¼	14.02
½	13.33
¾	12.66
1	12.02
1¼	11.42
1½	10.88
2	9.80

pose involves some difficulties, but that the operation is practicable may readily be shown. The weight of gas in the bag, based on our sea-level density and volume, is

$$26{,}820 \times 0.00604 = 162 \text{ pounds.}$$

Let the escape valve be opened, while at an altitude of 2,200 feet, so that 5 pounds of gas may escape, the gas bag partially collapsing in consequence. Suppose the elasticity of the bag to be such that the gas pressure now becomes 16.7 pounds per square inch. Equation A gives

$$D_h = P_h \div 5.347\ T_h = 16.7 \div (5.347 \times 530) = 0.00589,$$

and the volume of the partially collapsed bag is now

$$157 \div 0.00589 = 26{,}740 \text{ cubic feet.}$$

The necessary buoyant power being $1{,}900 \div 26{,}740 = 0.07105$ pounds per cubic foot, the external air must weigh $0.07105 + 0.00589 = 0.07694$ pounds per cubic foot, and Equation B gives

$$P_a = 0.3706 \times 0.07694 \times 480 = 13.64 \text{ pounds per square inch,}$$

corresponding to an altitude of

$$2{,}000\ (14.7 - 13.64) = 2{,}120 \text{ feet.}$$

We have descended 80 feet and have reduced the net pressure on the bag to 3.06 pounds per square inch, but at the cost of 3 per cent. of our gas. By letting out more gas we may descend further. The method seems adequate; but what are we to do if we should wish to rise again? We are wastefully throwing away the life blood of the balloon, its gas; and this in spite of the fact that there is a constant dangerous leakage through the fabric itself which is alone sufficient to bring about disaster and which we should counteract rather than encourage.

Three Chimerical Methods.—A writer of romance has equipped his aeronautic heroes with a complete gas generating plant so that all losses might be made up. This plan need scarcely be considered here; the supplementary device of heating the contents of the bag in order to dilate the latter and consequently decrease the value of D_h is more interesting, and would be practicable if a sufficiently elastic bag of proper strength could be obtained. At present the fabrics necessarily employed to secure strength are not very elastic, in spite of their lightness, so that this method of varying the density of the gas seems impracticable. Another method which has been contemplated is shown crudely in Fig. 5. The stiff dished heads H, H, say of aluminum, are connected by a fabric shown in part at F, which is attached to rings R, R, free to slide on telescopic rods T, T, T, T. The fabric then corresponds with the expansible part of a bellows. By means of the leverage a b c d e, actuated from outside the car, the ends may be caused to approach or recede, the fabric folds being correspondingly flattened up or straightened out, and the volume of gas decreasing or increasing, so that if its weight be kept constant, the density will vary inversely, and the altitude directly, as the distance between the two movable heads. The objections to the plan are obvious.

Don'ts for the Autoist

GENERAL INJUNCTIONS TO THE WISE—AND THE OTHERWISE—NOT ALONE AMONG THE AUTOMOBILE FOLK, BUT IN OTHER WALKS OF LIFE AS WELL

Don't forget that the foundation of success is deep down in the strata of concentration.

Don't trade off the power to fix the mind upon some one thing for a mess of pottage in the form of scattered thoughts.

Don't fight with your neighbors when the pugnacious desire comes on; go after yourself; ply the gloves valiantly; let yourself know that you will stand very little nonsense.

Don't allow your vividity of mind to settle upon your stomach and prey upon your telegraph system; place all excesses of vividity in cold-storage, lock the door and throw the key away.

Don't risk having the truth come to you in a violent form, as it will if you do not study moderation of thought.

Don't achieve blasé notoriety, nor allow the mind to petrify.

Don't drift along or float; flap your fins; churn up the seas of activity, have a wake, but trace it over a straight course in deep water.

Don't go on fudging up your future; have a real object in life; be prudent, but be active.

Don't be a drifting derelict; swim!

Don't allow the world to write your epitaph in lying charity; compel the general tongue to articulate.

Don't ever get the idea that you must have a flying start to get anywhere; the greatest enemy to sound progress lies in a friendly push; he who pushes must have pay.

Don't court the clock, caress the thermometer, or allow visions of beauty to lull you to sleep; sting the mind if it refuses to obey the dictates of industrious concentration—make it unconscious of the buzz of the house-fly, not by sleep, but by a determined effort along fixed lines.

Don't dream beautiful sonatas; they are heavier-than-air bodies, and, unfortunately, they lack motive power sufficient to get you anywhere.

Don't let time get away from you, nor forget that it goes on ceaselessly; if you desire to keep up, imitate time.

Don't forget that he who makes the giants, strangles them.

Don't awaken from a period of inactivity and omit to say, "I have been ill—I am better now!" and straightaway engage the mind in serious wrestle with some likely problem.

Don't forget that the ordinary pretext of those who make most of the misery of others is that they wish them good.

Don't forget that rogues are communicative; their thoughts are of no use to themselves; the chance of gain lies in having someone add the pollen.

Don't plunge back into the crowd once the feet have disentangled you from the maze of the commonplace.

Don't, oh modest hypocrite, peddle wares in the market-place of stalking intelligence.

Don't be the soundless tenor in the choir of real voices.

Don't dart forward when some wag calls out for a fool.

Don't tackle a job unless fraught with determination.

Don't be a pointless commonplace; better be a bland surprise.

Don't forget that they who lag late on the road may want money for supper.

Don't be an ill omen; color the worst thought; make it vie with the spectre of the brightest rainbow.

Don't console yourself with the thought that a live dog is better than a dead lion; it is the lion who lives on forever.

Don't overlook the fact that the devil himself would not support an attorney with a bad brief.

Don't write "private" and "confidential" across the paper that discloses a secret; burn it.

Don't forget that the tool is broken after it serves in a poor cause; dodge the part of tool; let a fool play it.

Don't be mild, indolent, irresolute; some calling such crimes by the kindly appellation, "meditation."

Don't forget to baffle the ingenious swindler; all that he wants is your money—lock it up.

Don't gather the notion that you are a slave because you are made to work; why do you wait for someone to tie a stick of dynamite to your tail?

Don't obey the impulse; rather keep company with reflection.

Operation and Care

HANDY TRAVELING HOIST; QUESTIONS THAT ARISE; PRACTICAL REPAIRING; LINING UP WHEELS; LETTERS; CANTOR LECTURES; DON'TS; LUBRICATION PROBLEMS

THIS is the season of the year when the average automobilist considers the laying up of his car, due, perhaps, to his lack of appreciation of the fact that the automobile does not labor under any of the disadvantages of the horse. True, the automobile has its own peculiar failings, but they, such as they are, will bend to intelligent treatment, and it should be the business of the user to find out what they are and apply the right treatment in every instance. Take, for illustration, the question of the freezing of the cooling water. There is no occasion for risking it; water will freeze at 32 degrees Fahrenheit; do not use this cooling solution. The best plan is to mix with the water such a quantity of denatured alcohol, or other efficacious compounds, as will prevent the solidifying of the solution, but care must be exercised not to use substances that are not suitable in view of the several conditions. It was only the other day that an automobilist of much discrimination put corn-meal into the radiator, and he is now trying to discover some way of getting corn bread out of the cooling system. THE AUTOMOBILE, however, much as it has tried to help automobilists along the pathway of roses and pleasant dreams, 'fesses that it labored under the impression that everyone knows how to make bread; but this particular automobilist, even in a dire extremity, might have consulted his wife about this particular matter.

The great question is to remember that an automobile will run in cold weather even better than it will go during Summer's heat, and it is during the inclemency of Winter-time that the greatest good should be experienced. There is nothing to fear from the cooling question; just use a suitable mixture; the ingredients have been exploited repeatedly in THE AUTOMOBILE, but if there are some of the readers who may have failed to grasp the situation, it will be easy for them to purchase a quantity of denatured alcohol, and to each gallon of water used in the system add three pints of the alcohol—the freezing temperature will then be about five degrees Fahrenheit above zero.

Perhaps there is another angle to this question; most automobilists seem to labor under the impression that "technical" literature, so-called, is not for them. It would come as a great surprise were they to be told that there is no literature that is worth reading if it is so mysterious that it fails to convey the intended impression, and the class of technical literature, so-called, that cannot be even looked at is like the *news* in the paper which, not so long ago, made the editorial announcement that it was a newspaper; the editor of this *novelty* was the only person who was conscious of the news value referred to.

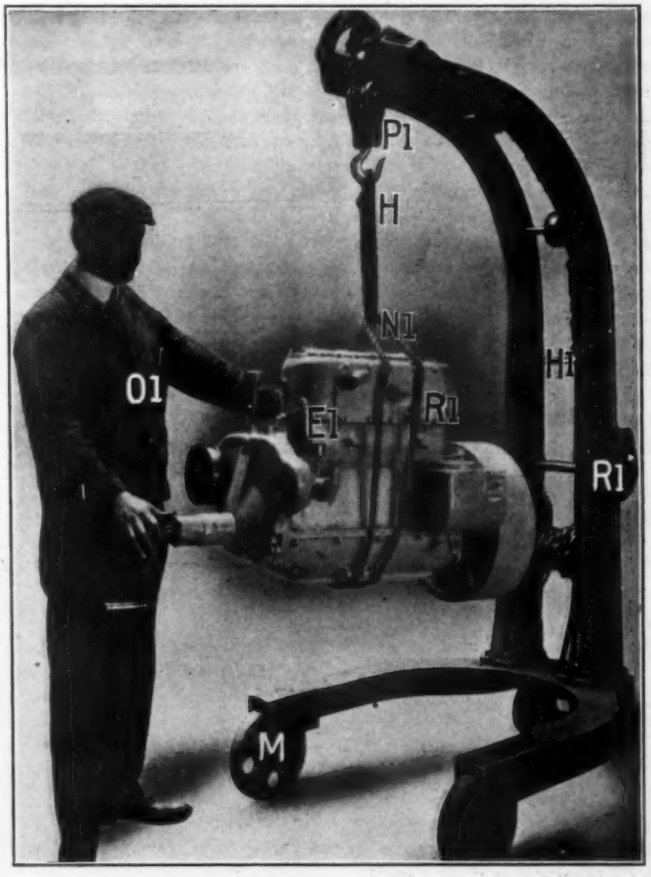
Traveling Hoist

Showing a White Motor Ready to be Fitted in Chassis After Overhauling

NO garage or repair shop can claim to be completely equipped unless it possesses a traveling hoist. It is surprising the multifarious duties such a shop adjunct can be made to perform, from lifting out a motor to raising the chassis to insert grease or oil between the leaves of the springs. With this convenience installed, there is no necessity to call several men off their jobs to come over and lend a hand at this or that, and it is not an unknown occurrence that a part has been damaged through an unlucky fall or a man has had his fingers badly pinched and been compelled to remain in that position till more men could be summoned to release him. The part to be lifted is bound around with the rope R1, forming a loop knot N1 just above and suspended from the hook H1. A crank is attached to the ratchet R1 and wound up or down as may be required. In this case a motor in the White Company's New York garage had undergone a complete overhauling in the repair shop and was carried thence to the chassis in the main assembly room in such a state that it only required bolting *in situ*. This saves a lot of valuable space in any repair shop, doing away with the congestion that occurs through lack of the means of transporting heavy parts.

Pressure-fed Gasoline.—In order to obviate the ridiculous operation of pumping up pressure for several minutes before starting by sending air into the gasoline tank, in the case of cars thus fitted, this pumping can be avoided and the following may be of service to those autoists who have pressure feed supply:

Start the car with the gasoline contained in the float chamber; there is usually enough to give a few explosions. Then run to the back of the car and block up with the sole of the shoe the exhaust pipe outlet, and the pressure having only one outlet left, viz., through the relief valve in the pressure circuit, the pressure in the gasoline tank will rise quickly. It will not be necessary to stop up the hole long and there is no likelihood of burning the shoes. This method of obtaining pressure can be resorted to in case the pressure pump gets out of order.



A most useful tool for garage work generally. It can be used in multifarious ways

Questions That Arise

SOME OF THOSE THAT COME UP IN EVERY-DAY AUTOMOBILING ARE ANSWERED BY THE MATTER WHICH IS BEING PREPARED BY FORREST R. JONES IN THE NEW EDITION OF THE "AUTOMOBILE CATECHISM" THAT WILL SOON GO TO PRESS

[314]—What precautions should be used in charging the acetylene gas generator?

It should not be filled more than two-thirds full. When lump carbide is used it expands as the chemical change produced by dropping water on it takes place.

[315]—How can the burner tips of an acetylene gas burner be cleaned sometimes?

By picking the carbon deposit out of the orifices with a small pointed instrument such as a sewing needle. If the deposit is too hard to be picked out in this manner a small drill can be used. The tips should not be treated roughly since they are brittle and weak.

[316]—Give the events that occur in a two-stroke cycle (usually called two-cycle) engine in the order of their occurrence.

As a convenient method for a beginning, it will be assumed that there is a compressed charge in the combustion chamber, and the piston in its position nearest the combustion chamber. When a charge is fired the piston is driven out on the impulse stroke by the pressure caused by the combustion until the stroke has been nearly completed. A number of small port holes arranged circumferentially around the cylinder walls and previously covered by the piston are then uncovered by its motion. The gases in the cylinder still being under considerable pressure rush out through these openings which form the exhaust port. Still further motion of the piston on the impulse stroke uncovers another row of port holes circumferentially arranged, which connect with the crank chamber. When the piston starts on the impulse stroke the crank chamber is filled with a combustible mixture at about atmospheric pressure. The impulse stroke compresses this mixture so that when the inlet ports—just referred to as being uncovered by the piston—are open a charge passes from the crank chamber to the cylinder and combustion chamber. The next stroke (up-stroke in a vertical engine, in-stroke in a horizontal engine) of the piston closes first the inlet port, then the exhaust port, and finally compresses the charge in the cylinder. On the compression stroke, mixture is drawn into the crank chamber. This completes all the operations related to the cycle. As the name indicates, the complete cycle occurs in the two strokes of piston corresponding to one revolution of the crankshaft.

[317]—Does the gasoline engine main shaft reverse its direction of rotation when the car changes from forward to backward motion?

No. The change-speed and reverse gears provide for this.

[318]—Will a four-stroke cycle engine run its main shaft in either direction?

No. Except in very unusual designs.

[319]—Can a two-cycle engine be run in either direction?

Yes. By moving the timer to ignite properly, it will run equally well in either direction of rotation—clockwise or counter clockwise. This applies especially to one which has no mechanically operated valve, such as the valve in the crankcase.

[320]—How are the cylinders placed in a two-cylinder opposed engine?

On opposite sides of the crankshaft.

[321]—How do the pistons move in a two-cylinder opposed (horizontal) engine?

They move toward each other during one-half revolution of the crank and both recede during the remaining half-revolution.

[322]—How is compression produced in the crank chamber of a two-cylinder opposed engine?

By the motion of the pistons toward each other.

[323]—How do the pistons move in relation to each other in a four-cylinder vertical engine of the four-stroke cycle type?

The front and rear pistons move upward together at the same time that the intermediate ones move down together. This is the usual construction.

[324]—In what order are the successive charges exploded in a four-cylinder four-stroke vertical engine whose pistons move as just described?

Starting with the front cylinder they come in the following order: (1) Front cylinder; (2) one of the intermediate cylinders; (3) rear cylinder; (4) remaining intermediate cylinder.

[325]—Where is the gasoline tank placed in relation to the carbureter?

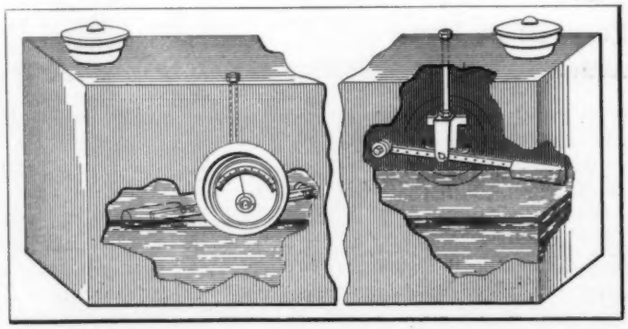
Either high enough above it for the gasoline to flow by gravity into the carbureter, or it is placed below the level of the carbureter.

[326]—What precaution should be taken for allowing free flow of gasoline from the tank in the gravity system?

There should be a small opening (vent) in the top of the tank. It is usually in the plug; 1-32 inch diameter is sufficient. It is advisable to have the metal raised in a hump or knob where the vent hole is made. This will prevent stoppage by collected dirt.

French Gasoline Gauge for Fuel Tanks

A gasoline gauge has been devised by the use of which perforation of the side wall of the gasoline reservoir is entirely avoided, thereby eliminating the possibility of leakage and forestalling accidental fire losses. From the top of the tank and contiguously to one of its walls there is suspended a magnet bar, to one end of which a float is attached. The magnet turns around its central point of suspension as the float goes up or down with the level of the gasoline. A cup-shaped dial is soldered to the outside of the same wall of the tank and a thin bar of steel—also magnetized, says the account—is mounted under it so as to turn freely around a point exactly corresponding to the pivot of the interior magnet, whose movements it will closely follow, and a band attached to the exterior magnet points at an index scale, telling the exact quantity of fuel in the tank. Automobilists who pass in and out of Paris are required to have their supply of gasoline measured at the excise district boundary—the *banlieue*—and the gauge facilitates the work of the excise officers, particularly as the moving parts may be readily sealed and prevented from acting.—*La Pratique.*



Gauge devised to enable French excise officers to quickly ascertain quantity of gasoline in an automobile tank

Communication in Relation to Formula

IN relation to the A. L. A. M. formula for estimating the horsepower of a 4-cycle internal combustion motor, as discussed on page 879 of THE AUTOMOBILE, November 24, it would seem that for reasons that should be well understood this formula fails of its purpose, as it is hopelessly inaccurate in comparing motors whose strokes differ widely. The reason for this failure lies in the fact that the A. L. A. M. rating is based upon a piston speed of 1,000 feet per minute and therefore upon the fallacy that the number of revolutions per minute varies in the inverse ratio to the stroke.

In Europe almost all the 1911 models have ratios of stroke to bore varying from 1 1-2 to 1 up to 2 to 1.

PRINCIPAL DIMENSIONS OF LONG-STROKE FOREIGN MOTORS

	Millimeters		Millimeters		Inches		Inches
Mercedes	70	by	120	or	2.75	by	4.72
Mercedes	80	by	130	or	3.14	by	5.11
Mercedes	90	by	140	or	3.54	by	5.51
Mercedes	100	by	130	or	3.93	by	5.11
Wolseley	90	by	130	or	3.54	by	5.11
Peugeot	70	by	130	or	2.75	by	5.11
Panhard	90	by	130	or	3.54	by	5.11
Panhard	100	by	140	or	3.93	by	5.51
Napier	82	by	127	or	3.22	by	5.00
Mors	75	by	120	or	2.95	by	4.72
Metallurgique	90	by	140	or	3.54	by	5.51
Metallurgique	101	by	150	or	3.97	by	5.90
Le Gui	75	by	150	or	2.95	by	5.90
La Buire	75	by	130	or	2.95	by	5.11
Germain	106	by	180	or	4.17	by	7.08
Germain	80	by	130	or	3.14	by	5.11
Fiat	80	by	130	or	3.14	by	5.11
De Dion	90	by	150	or	3.54	by	5.90
De Dion	75	by	130	or	2.95	by	5.11
Deasy	80	by	130	or	3.15	by	5.11
Darracq	75	by	120	or	2.95	by	4.72
Darracq	80	by	120	or	3.14	by	4.72
Darracq	100	by	140	or	3.93	by	5.51
Daimler	69	by	114	or	2.71	by	4.48
Daimler	80	by	130	or	3.14	by	5.11
Daimler	101	by	130	or	3.97	by	5.11
Calthorpe	75	by	150	or	2.95	by	5.90
Calthorpe	90	by	150	or	3.54	by	5.90
Brasier	70	by	120	or	2.75	by	4.72
Brasier	80	by	130	or	3.14	by	5.11
Brasier	90	by	140	or	3.54	by	5.51
Argyll	72	by	120	or	2.83	by	4.72
Argyll	90	by	140	or	3.54	by	5.51

This list is sufficiently comprehensive to indicate the tendency to long-stroke motors. That long-stroke motors can be built to turn fast is clearly demonstrated by the results of the Coupe des Voiturettes. It is calculated that many of the motors in that event had a piston speed of 3,000 feet per minute.

An examination of the table will be sufficient to convince anyone of the prominence that is being given long-stroke motors, and taking as a typical example the Gregoire with a bore and stroke of 80 x 160 millimeters (3.14 x 6.28 in.), by the use of large valves, light reciprocating parts, etc., these motors give from 50 to 100 per cent. more power than the A. L. A. M. formula would denote.

In my opinion a formula that is infinitely more accurate than the A. L. A. M. rating is $\frac{D^2SN}{12}$ in which D = bore, S = stroke, N = number of cylinders, 12 = a constant arrived at by considering 1,000 as the number of revolutions per minute. If the dimensions are in millimeters the formula reads, $\frac{D^2SN}{200{,}000}$

According to this formula the horsepower of the Gregoire motor above mentioned would be 20 1-2 at 1,000 r.p.m. or 30 3-4 at 1,500 r.p.m., while according to the A. L. A. M. rating the horsepower would be somewhat less than 16.

For four-cylinder motors my formula is simply $\frac{D^2S}{3}$, and for six cylinders $\frac{D^2S}{2}$, while the A. L. A. M. rating is $\frac{D^2}{.625}$ and $\frac{D^2}{.4166+}$. As whole numbers are more easily dealt with by the average man than fractions I think that my formula also scores on the count of simplicity.

A READER.

Graphite Paint.—Graphite mixed with pure, boiled linseed oil in which a small percentage of litharge, redlead, manganese or other metallic salt has been added at the time of boiling to aid in the oxidation of the oil, forms a most effective paint for metallic surfaces as well as for wood.

Practical Repairing

DEFINING THE PROCESS OF REPAIRING ALUMINUM CASTINGS BY THE OXY-ACETYLENE FLAME, ILLUSTRATING THE STAGES OF THE WORK STEP BY STEP

THE principle of the working of the oxy-acetylene flame was dealt with in last week's issue in so far as the equipment itself goes and its adaptation to cast-iron welding, and it may be stated that there is a great similitude between the processes as applied to all metals, the main difference being the handling of the metal by the operator. Until quite recently aluminum defied the repairman, and, although some solders were claimed to join aluminum parts that had been broken, yet its utility rested in filling cracks and holes on which there was no strain and where there was no attempt to approximate the strength of the metal. The difficulty to be overcome with soldering aluminum is the electrolytic action set up by the small amount of oxide which it contains and the attending difficulty in coating the surfaces without having an intervening layer.

This difficulty can be overcome with the acetylene flame, as when the surface of the aluminum is reduced to a molten state the fusion that takes place has a coating of oxide, and this can

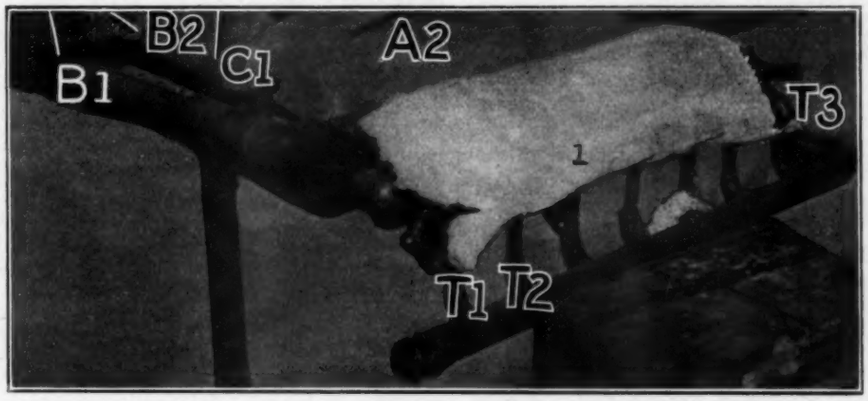


Fig. 1—View of gas burner heater over which the job is placed

be broken up by puddling with a steel tool, allowing the metal to run together, thus producing a weld that is to all intents and purposes a recasting. In the process here described there is no flux of any description used.

Fig. 2 represents the part over the fire with the charcoal F1 and the steel bar S1 in place. The cracks C1 and C2 are easily noticeable, also the parts that have already been repaired, R1 and R2.

The first operation (see Fig. 3) after the parts have been heated in the manner above described is to cut a V-shape slot W1 with a chisel C1 so as to allow the operator better access to the crack and start the melting from the base upward and so build in a new part on clean material. The heat from the flame is diverted from the operator by means of asbestos strips A1. For reasons above stated, to counteract the sudden contraction of the metal after the intense flame is withdrawn, a second operator O2, as shown in Fig. 4, heats the opposite side of the job with an ordinary gas blower B1, directing the flame F2 on the work C1. The operator O1 will be seen using a steel rod P1 to puddle the metal into shape while melting the part to be repaired with the acetylene flame F1. After a good foundation is thus made a stick of aluminum is held in the flame F1 and the molten metal allowed to run in the V-shape slot to a little above the height of the casting itself, and, as will be seen in Fig. 5, this is molded with a flat-ended tool T1 in the manner shown. This particular part of the casting is very thin and practically has to be rebuilt with new metal, for as soon as the flame touches it, it crumbles away.

During the whole operation the heating is continued underneath, and for this purpose the asbestos boards are placed over the fire to protect the operator. It will be seen that he is wearing two pairs of glasses G1 and G2; G1 he happens to wear in the ordinary way, but the second pair have dark-blue lenses to protect the eyes from the intense light given off by the flame despite the fact it is not above one-half to three-quarters of an inch in length.

Though aluminum fuses at a comparatively low temperature (1,200 deg. Fahr.) its high conductivity for heat, which has a ratio of 31.3 as compared with 11.9 for iron, makes it a necessity to use more heat in welding than is required by metals having a much higher melting point. The heat is conducted away from the weld into the surrounding metal to such an extent that when the surface to be welded becomes molten the metal for a considerable distance around is close to the point of fusion and liable to collapse if great care is not exercised.

It can be readily seen that one of the principal features of carrying out this work is the amount of time taken, as the longer the flame takes to fuse the metal the greater the amount of heat that is conducted into the surrounding parts; therefore, the hotter the flame the less the time and the conduction of heat. This is the reason why it is necessary to use a flame of such a high temperature (6,300 deg. Fahr.) as that produced by burning acetylene with oxygen to obtain satisfactory results on a metal of such a low point of fusion as aluminum. The amount of contraction of aluminum from the point of fusion to atmospheric temperature is three-sixteenths of an inch per foot, and from this it can readily be understood that unless great care is exercised there is a chance of the part cracking, due to the metal shrinking in cooling.

To overcome this the part is placed as shown in Figs. 1 and 2 over a gas fire with a charcoal base, and the part is heated uniformly, the amount of heat being regulated by the amount of gas by the taps T1, T2 and T3, in Fig. 1. To keep the heat in, a strip of asbestos A2 is placed over the entire job, and in this particular case of a half of a base chamber C1 that had several cracks, a bar of steel B1, the same size as the bearing B2, is placed under these to prevent warping. Fig. 6 shows the half of the crankcase that has been repaired at the points R1, R2, R3, R4, R5 before being cleaned up. This is part of a crankcase of a four-cylinder motor, and is virtually as good now as when originally turned out from the factory. The repairer is sometimes confronted with the problem that in some accidents parts

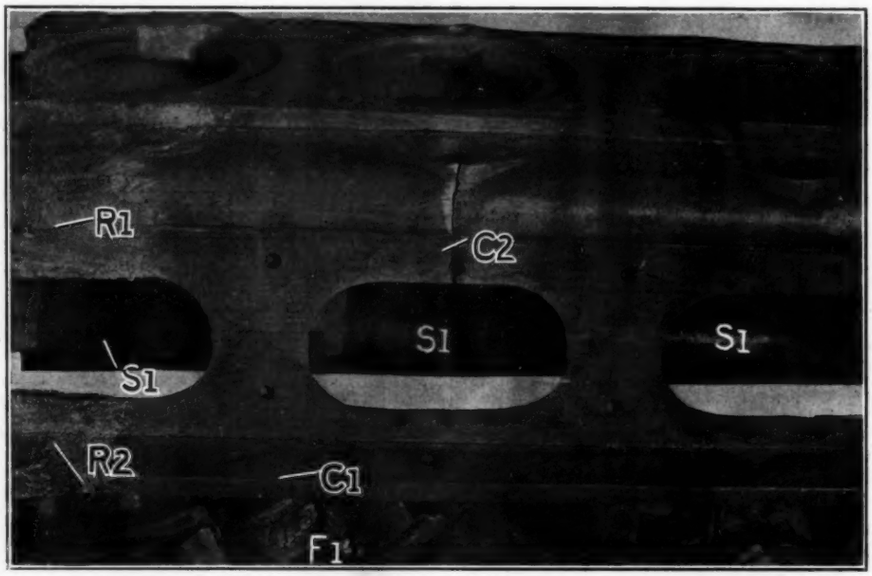


Fig. 2—Top half of aluminum base chamber, showing cracks and charcoal fire

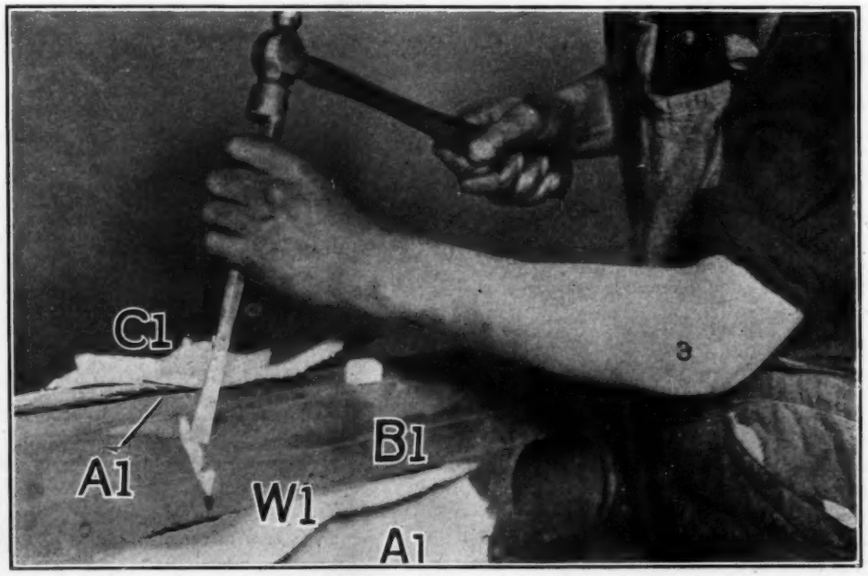


Fig. 3—Slotting crack with chisel so as to allow the new metal to run in freely

are lost or so damaged that they no longer resemble the original; but this is not really a drawback, as the broken parts that remain are pieced together and the missing parts are remade by filling the blank spaces with new metal by a building-up process, which consists of adding layer after layer till the gap is filled, and with the aid of a file afterward any unevenness is smoothed off level.

If a crankcase ruptures in service and it is due to an accident of some kind, the chances are that the quality of the aluminum found in the crankcase will be above suspicion, but if the rupture cannot be traced to some violent physical exertion, it will be futile to undertake a repair without first ascertaining whether or not the material in the crankcase is sufficiently good to warrant considering its further use. The mere fact that a crank case does rupture in service in the absence of violence will suffice to indicate that the material of which it is made is below a substantial standard. If this is true, the autogenous welding process, if it is invoked, will be for the purpose of joining the disrupted members of such inferior material that it would be inviting further trouble, but under more accentuated conditions.

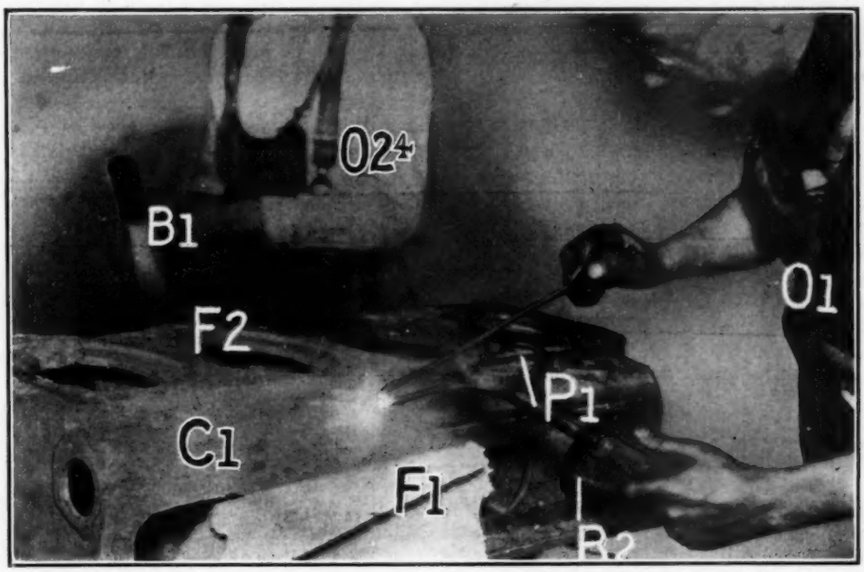


Fig. 4—Running in new metal to fill crack while the second operator heats the opposite side

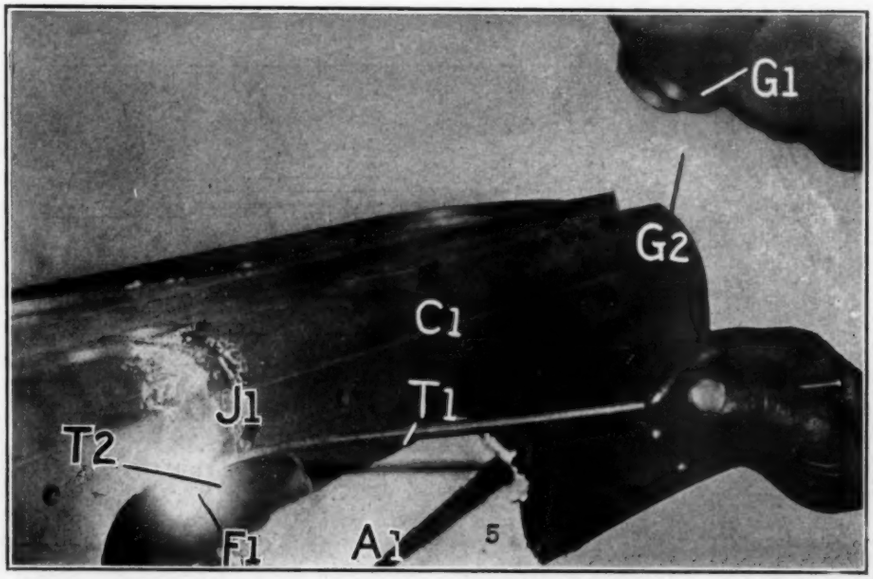


Fig. 5—The metal at this point is very thin and will melt at the slightest touch of the flame

The owner of an automobile, if he is confronted by the necessity of having the crankcase or the transmission gear case repaired or replaced by a new one, should find it to his advantage to be able to decide for himself, unaided by the repairman, which course to pursue. If the material in the broken member is so poor that it will not sustain under the work, it will not require the deliberations of an expert in the reaching of the conclusion that the re-joined parts by a welding process will not even be as strong as the original inferior member. If the owner of the car will take an ordinary machinist's hammer and strike the crankcase at a point near the fracture, if the material is inferior, provided it is of aluminum, the sharp blow will probably have the effect of breaking off one or more additional pieces, and a little more investigation along this line will soon prove to the unfortunate owner than an autogenous repair will be of no service to him. Should the broken case behave well under the rain of sharp blows, thus proving that it is not "cold-short," it will be time enough to call upon the repairman and ask him to join the broken parts.

The reason why it might be better for the owner of the car to conduct the primary investigation with a view to purchasing a new case rather than the making of a repair if necessary, is because the repairman would probably be able to autogenously weld the inferior material quite as efficaciously as if it were good, and he would consider no doubt that his responsibility is limited to the mere joining of the broken members, nor could he be expected to assume responsibility for the quality of the metal.

It is not to be expected that builders of automobiles will sanction the use of certain grades of aluminum castings for motorcases and transmission gear housings. Take for illustration the aluminum alloy known as No. 3; it is used in good automobiles for running boards and trim work; the composition of this alloy is substantially:

Approximate Chemical Composition of No. 3 Aluminum Alloy

Aluminum	65.0 per cent.
Zinc	35.0 per cent.

The impurities in this product would probably be very high. Silicon, which is fatal to good work, might readily reach over 1 per cent., and iron would probably go above ¾ of 1 per cent., but the worst crime of all would lie in the use of scrap, much of which would be devoid of a history.

A better aluminum alloy is that known as No. 2, with an approximate chemical composition:

Approximate Chemical Composition of No. 2 Aluminum Alloy

Aluminum	84.0 per cent.
Zinc	14.0 per cent.
Copper	2.0 per cent.

In this product, the aluminum should not be less than that as above given, and the copper should range between 2 and 3 per cent. Of the impurities, as silicon and iron, it is scarcely to be expected that the sum of these elements present will be below 1.25 per cent, and it is highly improbable that this alloy would be worth considering in exacting service, particularly if "scrap" is put

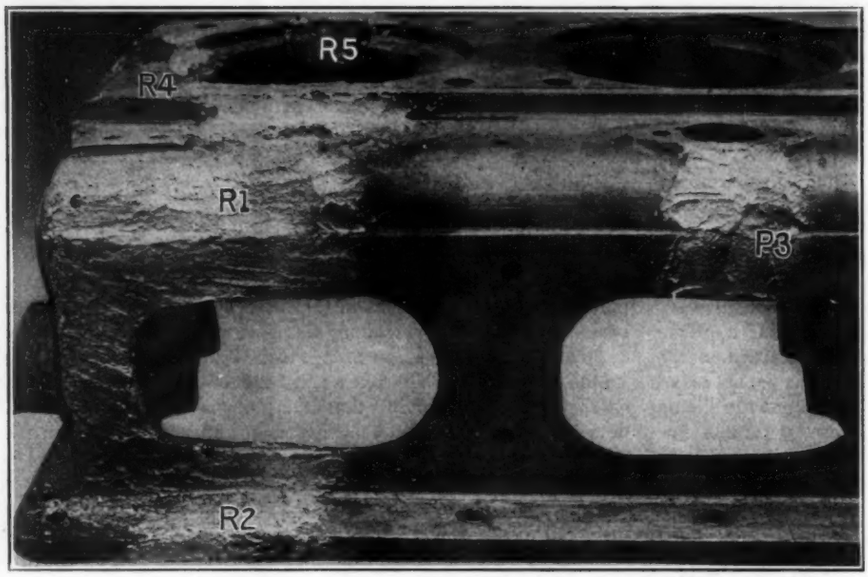


Fig. 6—Completed repair before filing and cleaning off

into the charge. An ordinary machinist's hammer in the hands of a man of no great strength will disclose the presence of excess of silicon and iron or the use of "scrap" in the charge, if the part is given a sharp blow—the pieces will fly with almost explosive force, this being a sign that the material of the case is so bad that a repair is not worth while.

Relatively good transmission gear and crankcases are composed of aluminum having properties—

Approximate Chemical Composition of No. 1 Aluminum Alloy

Aluminum	91.5 per cent.
Copper	8.5 per cent.

In this product, both aluminum and copper contents vary a little, and impurities are mainly copper and silicon, the sum of the two not exceeding 1.25 per cent. This alloy is supposed to be from heats using new metal only, and while the silicon and iron content is a little too high for the very best result, the castings resulting are nevertheless good. but even castings from such good alloy may fall short of the requirement, due to overheating and other foundry miscalculations. To some extent the responsibility for bad work is to be charged to inferior designing methods.

While the subject is up, considering the importance of fine castings in motor work, it is not too much to say that the best possible results obtain when the foundry uses virgin metal, limiting iron to less than 0.40 per cent. and maintaining the silicon content within 0.50 per cent.

The photographs illustrating this article, as well as that referring to cylinder repair in last week's paper, were taken at the plant of W. R. Smith & Co., 304 and 306 West 52d Street.

Lining Up Wheels

ALTHOUGH TIRES ARE CARED FOR AS INDIVIDUAL UNITS, YET A SMALL INACCURACY IN ALIGNMENT WILL IN ALL CASES CAUSE UNDUE WEAR

THERE are times when one has to utilize what one has on hand to carry out a repair, and a stray piece of metal or string is often very welcome. But when it comes to tires only the best is good enough. Makeshift methods of lining up the wheels should be given a back seat and the autoist will do well, if he has not the necessary appliances, to consult some competent repairer if he finds his tires do not give the service the makers guarantee. Unless the road wheels of a car are perfectly in line with the chassis—and themselves, which must follow if the former is the case—there is added to the rolling and driving strains a side dragging or uneven wear on the part of the tire not intended to come in contact with the road. To better illustrate this, if reference is made to Fig. 1 it will be seen that the wheels W1 and W2 have a decided inward inclination—what is known as toeing inward. This is not such a frequent occurrence as when the wheels have an opposite inclination; that is, the front of the rim is farther from the chassis than the rear part. The consequence is that the dragging will take place at A and B, and instead of wearing even the tires will be treated in a similar manner as when they are put on a buffing machine to take off superfluous rubber before repairing, the only difference being that in this case the road acts as the buffer and remains stationary while the tire takes the place of the buffer and rotates. The effect, however, is the same on the tire, which is the point at issue.

While on this subject of toeing it would be as well to relate the experience of the driver of a truck who had the misfortune to strike a slippery incline in New York and found it impossible to avoid sliding to the curb off the crown of the road

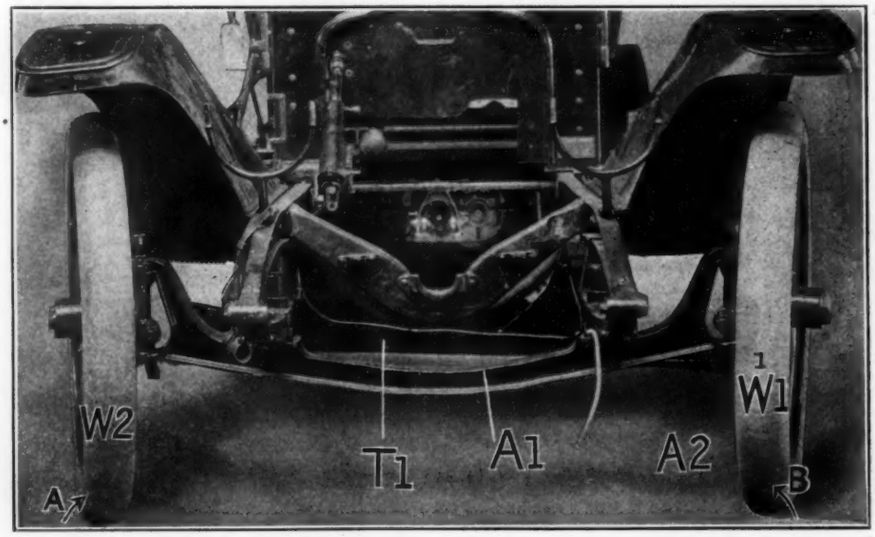


Fig. 1—Showing front wheels toeing in too much, inducing extra tire depreciation

when the brakes were applied at a cross-road half-way down the incline. The man was a good driver and had been in the employ of the company for some time. When asked to explain the reason and cause of the accident he said that it was impossible with that particular car to keep it on the road at that particular spot if the brakes had to be applied and the roads were at all skiddy. And he went on to say further that if he had to negotiate it again under similar conditions the result would be the same; but if he might fix the car up as he wanted to he thought it was possible to eliminate 50 per cent. of the skidding. In order to test the first half of his statement, that it was impossible to avoid the skid, another driver was told to take the car out and disprove what seemed to be bad driving, and the principal awaited the result. It was not long in coming and was in the nature of a telephone call to send a new wheel out, as the car had skidded badly and struck the curb and could not proceed without the new part. The first man was then allowed to do what he wanted, and it was to toe the front wheels inward at the front a matter of one-fifth of 1 degree, which on a 36 x 5 wheel would be equal to 3-16 inch; but should the tires be smaller the amount of toeing might be increased to, say, one-fourth of 1 degree for 34 x 4-inch tires.

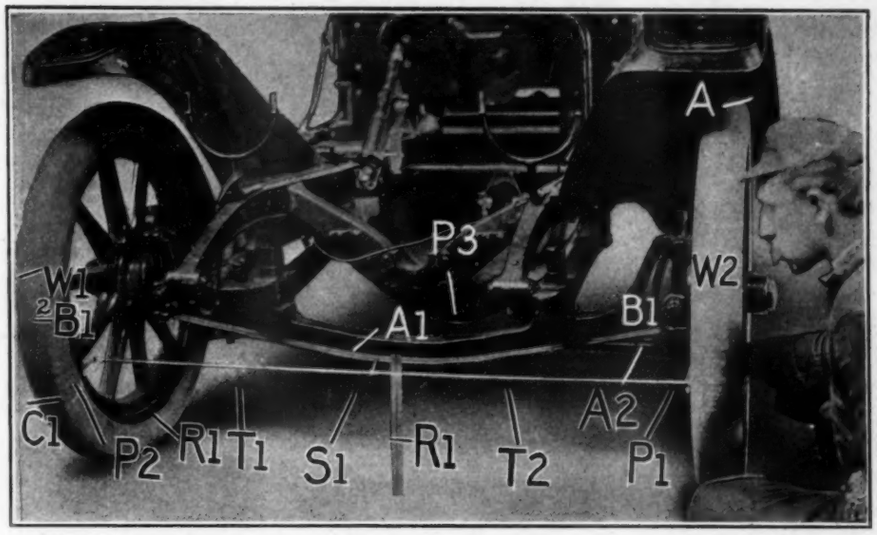


Fig. 2—Showing method of aligning the wheels, using rule and telescopic pointing tool

This represents a fraction over the point where lost motion starts through non-parallelism of the wheels, and consequently places a resistance on the forward motion not sufficient to appreciably stop the momentum. Besides this he contended that it was necessary to allow a small amount of power to remain on while braking, so that the rear wheels had a better purchase on the ground. This solution solved the difficulty and the car was driven over the same road again without the semblance of a skid.

The accompanying illustrations were taken at the White Company's New York garage and clearly show the practical way of realigning the wheels should they become out of line through accident, wear of bearings or spreading of the axle, which in most cases can be put down to overloading.

There are three ways a wheel can be out of line—firstly, in the manner indicated in Fig. 1, known as toeing, which, as previously stated, may be an inclination to the front or rear; secondly, undue splaying, when the top of the wheel is farther out of a perpendicular line drawn through the axle pivot than 5 per cent., unless, of course, the makers originally make this setting more; 6 per cent, is an outside limit. Unless the rear axle is specially constructed so as to allow for splaying, the wheel should be a true perpendicular to the road, the above percentage of splay being applicable to the front wheels only.

The third way is that the parallelism of the two axles is upset and causes the wheels, although parallel to the chassis when facing forward, to take a wrong angle when turning a corner, causing a drag and consequent undue amount of wear on the tires. The usual causes of this are either a bent axle or the spring center pin breaking and allowing the spring to slide on the axle plates. One cause, which cannot be remedied by the following methods of alignment, is when the frame becomes twisted.

The method of finding out whether the wheels toe can be seen by referring to Figs. 2 and 3. The operator is compelled in this case to take a point on the rim C1 10 inches above the floor (which must be level), the reason for this being that the pan P3 prevents him taking the measurements at the point where the difference is likely to be greatest, viz., a point midway between the floor and the top of the wheel B1. The calculations, however, will be just as accurate, for if the differences at this point C1 are more than they should be (as stated above), the difference at the point B1 will be increased.

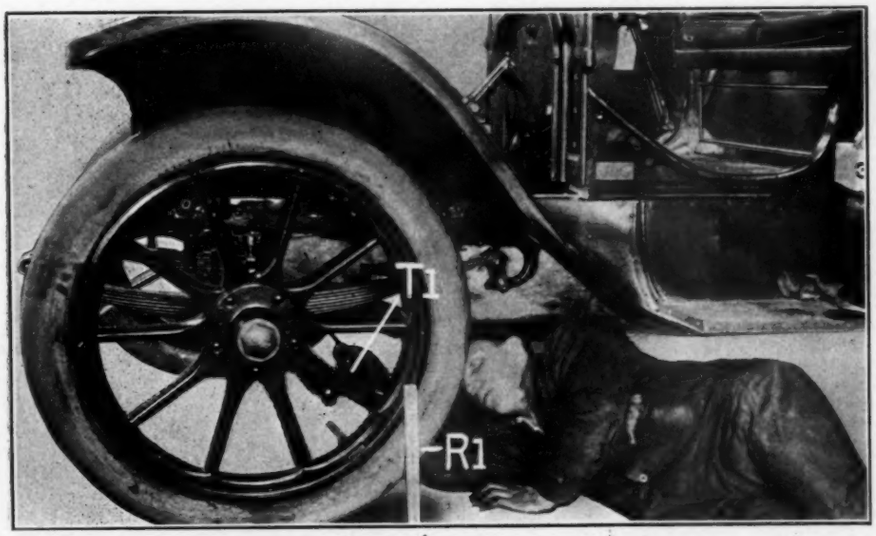


Fig. 3—With the same tools the rear of the wheel is trued and adjusted on the connecting bar

The instrument used in this case is a telescopic tool T1 and T2, with a set-screw S1 to lock the parts in a fixed position. The part T1 slides inside T2 and the ends P1 and P2 are turned over and pointed to form a scribing tool. The rule R1 is marked with chalk to permit easy reading of the measurement. The rims R1 are also marked off at the same height C1. The tool is then extended to touch the rim R1 at the point C1 on the wheel W1 and a point at the same height on the wheel W2 and the set-screw S1 locked. The instrument is then taken in the manner shown in Fig. 3, and after the height markings have been made, as in Fig. 2, it can be determined how much the wheels toe, if at all.

Most cars have the tie bar T1, in Fig. 1, fitted with adjustable ends, and it only remains to tighten or loosen the adjustment A2 in order to set the wheels.

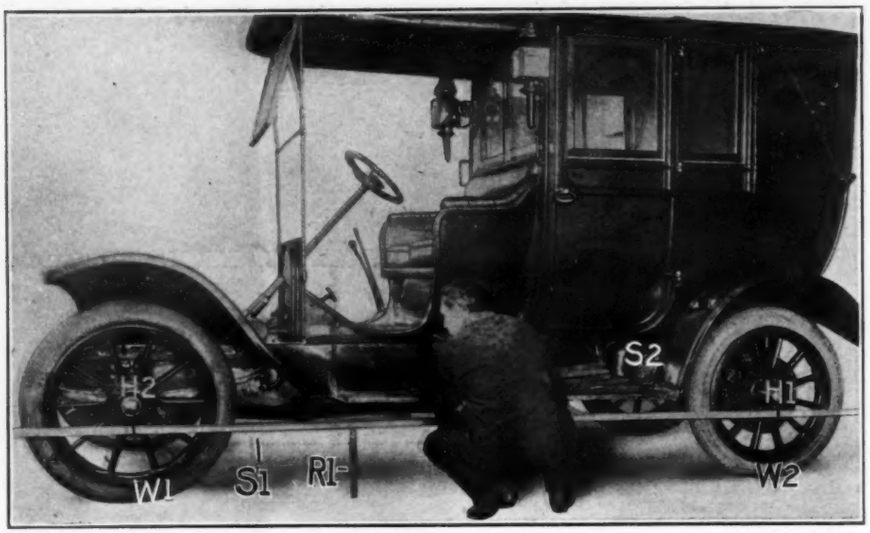


Fig. 4—Using a long square edge and a rule the alignment of all four wheels can be verified in the manner shown

Splaying of wheels can be treated in a similar manner, only in this case the measurements are taken at the top and bottom. It must be remembered that measurements must be made at the rims and not at the tires.

In order to keep the axles of the car at right angles to the chassis the springs have a center pin through them which is fixed in a recess on the axle boss, and provided the spring clips do not work loose this angularity should be retained. There is a possibility of this pin, however, being broken. Should this happen the springs have nothing to hold them in place, and the axle is free to move backward or forward. This will be noticed by the altered position of the spring clips on the springs, and the remedy is to fit new pins. A bad jar on the axle may twist it slightly—an amount hardly perceptible to the eye, but sufficient to put the wheel out of line. Fig. 4 shows the means of finding this out without taking them off.

In Fig. 4 the operator will be seen holding a straight edge S1 resting on a Rule R1 (it requires two men to effectively manipulate the long tool). The center of the hubs are marked off; or, better still, remove the hub caps H1 and H2, and as the axle ends are usually centered, the centers can easily be found. The opposite side wheels should have the same distance measurements as those first measured if the car is fitted with a live-axle type transmission. With a chain-driven car the procedure is different, as the tension rods to tighten the chains are seldom equal in length. The sprocket case S2, in Fig. 4, must be removed, and the distance taken from the center of the front axle to the center of the jackshaft axle will give the alignment of the front wheels. With the tool used in Fig. 2 it is possible to find out which tension rod is the longer, caused by the stretch of the chains.

To find out if the chassis has taken a twist it is necessary to remove the body and measure up for height and parallelism with a straight edge. This is not an undertaking that the average automobilist should consider too difficult to undertake, but some care should be exercised in the process.

Letters from Subscribers

THIS DEPARTMENT IS DEVOTED TO THE ANSWERING OF LETTERS FROM SUBSCRIBERS ON ANY SUBJECT RELATED TO THE RUNNING OF AUTOMOBILES

Floating Piston Pins Do Much Damage

Editor THE AUTOMOBILE:

[2,456]—A few days ago my motor suddenly shut down, and when it was taken apart in the repair shop the repairman discovered that one of the piston pins went adrift, and I am now awaiting a new cylinder from the maker of the car, but the problem which confronts me is: How will I prevent the recurrence of this type of trouble?

Camden, N. J. SUBSCRIBER.

Referring to Fig. 1, four methods of holding piston pins in place are given, and of the four it is possible that (A) is the least desirable; (B) represents a very good plan in which one

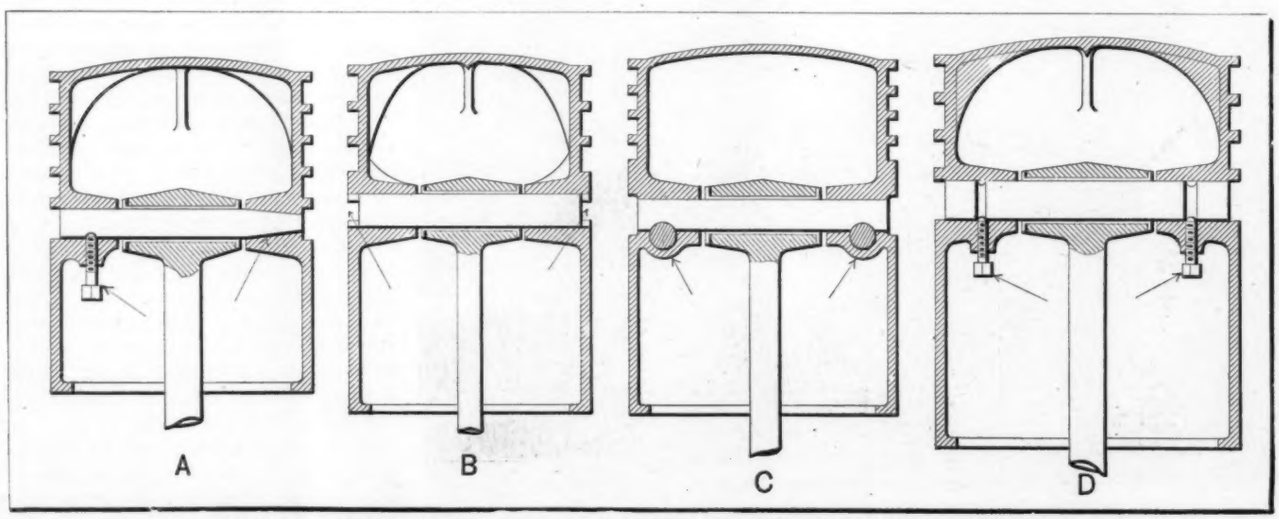


Fig. 1—Sections of pistons, showing four ways of so fixing the piston pins that they will not float out

of the piston rings is put on in a groove in a plane of the piston pin after the pin is inserted into place, so that the section of the ring would have to be parted before the pin would be free to float out. (C) shows a very good way, utilizing two bolts, cutting through the diameter of the pin at two points, so that it is prevented from floating out through the interference of the bolts. (D) shows a very common method of holding the pins, utilizing studs with a fine taper-thread with grooves cut in the pin so that when the studs are fetched up tight the ends thereof register in the grooves.

Wants to Increase the Cooling Effect

Editor THE AUTOMOBILE:

[2,457]—I am a great believer in air-cooled motors, and I have in mind the idea of experimenting upon a type of air-cooled motor with a view to increasing the cooling efficiency without adding to the complication. The enclosed sketch will give you a rough idea of the method I propose to employ, and I would like to have your criticism of it. READER.

St. Louis, Mo.

Your sketch (Fig. 2) is very interesting, but it is not believed that there is anything very practical about the plan. In the first place, when the car is standing still and the motor is running it will heat up unduly, and much smoke will be generated, due to

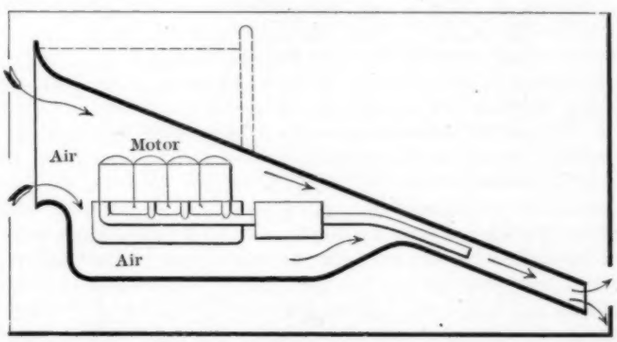


Fig. 2—Showing a plan of ventilation and cooling of an air-cooled motor that looks too attractive to be good

the burning of lubricating oil, and this smoke instead of passing out of the exhaust orifice to the rear will be distributed so that some of it will pass out through the front and envelop the car to the annoyance of the more æsthetic of its occupants. You also propose to have the cylinders with a smooth exterior and the probabilities are that the radiating surface will be insufficient. It takes 40 square inches of water-brushed surface to handle 1 square inch of flame-swept surface for proper cooling of an automobile motor, and this fact is sufficient to indicate that your problem will be a difficult one to handle, especially since you make no provision for the enforced delivery of air on an equality basis to the respective cylinders.

Pressure of Clutch Springs

Editor THE AUTOMOBILE:

[2,458]—I have had trouble with my clutch for some time past and have thought of fitting a new spring to overcome the slipping that I cannot cure, although I have had a new leather. I have dressed it well with castor oil, and while it was slightly rough from the turning it held, but now it has become smooth the slipping has started again. I should be obliged if you will tell me how I can calculate the strength of spring required and what the angle of the cone should be.

Montpelier, Vt. LEATHER CLUTCH.

The angle of the cone of the clutch should be about 12 to 14 deg. The formula to find the strength of spring is as follows:

Let T_w = the pull in pounds exerted at a mean radius to transmit the required power,

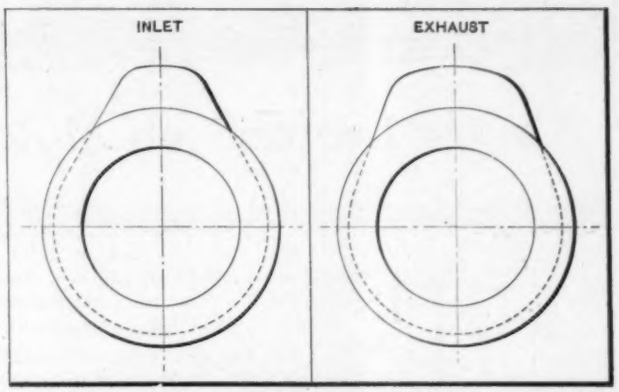


Fig. 3—Inlet and exhaust cams, showing that they are not of the same contour

N = the number of revolutions per minute,

r = mean radius of the clutch in feet,

H. P. = the power to be transmitted at the required revolution,

then H.P. × 33,000

$$T_w = \frac{}{2\pi \times r \times N}$$

Draw a sketch of your clutch after finding the exact dimensions in the manner indicated in Fig. 4 and let AD be a center line coinciding with the axis of the driving shaft. From a point A on the line AD draw AC normal to the face of the clutch, and from C draw CB at right angles to AD. Then if AB to scale represents W, the force pushing the inner part into the outer part of the clutch AC to the same scale equals R, the pressure exerted between the faces of the clutch.

Produce CD to cut the center line AD at point A and let a = angle ADC.

Then $$\frac{AB}{AC} = \frac{AC}{AD} = \frac{W}{R} = \sin a$$

$$\therefore W = R \sin a$$

and $$R = \frac{W}{\sin a}$$

If μ = the coefficient of friction of the rubbing surface, then to transmit the horsepower required $R\mu$ should be equal to T_w. Hence

$$W = \frac{\text{H.P.} \times 33{,}000}{2\pi r N \mu} \sin a$$

Inlet and Exhaust Cams Not of Same Shape

Editor THE AUTOMOBILE:

[2,459]—In examining my motor I find that the inlet and exhaust cams are not of the same shape, and my lack of familiarity with the subject makes it impossible for me to know whether or not the builder made a mistake. Will you put me right?

Memphis, Tenn. A. L. M.

An examination of the inlet and exhaust cams, as shown in Fig. 3, will suffice to indicate to you that the respective cams are definitely shaped to different angles, although in this case the lift is the same for both. The reason why the two cams do not shape to the same combined angle is because the inlet and the exhaust valves are not held in the open position during the same number of degrees of rotation of the camshaft or of the crankshaft.

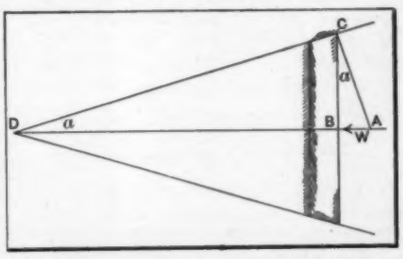


Fig. 4—Diagram of a cone clutch used to show what the spring pressure must be under "holding" conditions

Cantor Lectures on Motors

PROFESSOR W. WATSON, D.S.C., F.R.S., DELIVERED A SERIES OF LECTURES ON THE GASOLINE MOTOR, OF WHICH THIS IS THE FINAL INSTALLMENT—BY PERMISSION OF THE ROYAL SOCIETY OF ARTS

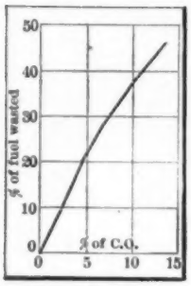


Fig. 34—Showing heat wasted for different percentages of carbon monoxide in exhaust

FROM the numbers which have been given it will be evident that the loss of efficiency due to heat losses in the cylinder is not very great, the reason that the efficiency falls so much below unity being that, owing to the cycle of operations in which the engine works, only a fraction of the heat supply can possibly be converted into work. In order to see how nearly the actual engine approaches the performance of the ideal engine, we may calculate what is called the relative efficiency, that is, the ratio of the efficiency of the actual engine to the efficiency of the ideal engine having the same compression ratio, the working substance being supposed to have the same properties as in the actual engine, that is, the specific heat being taken as variable. Such a comparison for three values of the compression ratio is here shown:

Compression ratio	Compression pressure in lbs. per sq. in. above atmospheric pressure at a speed of 1,000 revolutions per minute	Actual efficiency (maximum at speed of 1,300 revs).	Ideal efficiency	Relative efficiency
4.71	86	.275	.367	.749
4.35	77	.272	.354	.769
3.92	68	.263	.337	.780

It is evident from this table that as long as we confine ourselves to the Otto cycle, however much we reduce the thermal losses in the engine, we cannot improve the efficiency more than about 20 per cent.

I now return to the discussion of the manner in which the efficiency of an actual engine changes with the strength of the mixture. Starting with a mixture containing 14 parts of air to 1 of petrol, and decreasing the strength of the mixture, we see that the efficiency increases; that is, for a given heat supply per cycle the losses are reduced. The reason for this is that as the strength of mixture is reduced the temperature reached after combustion is also reduced. This has a beneficial effect in two ways. In the first place, the lower the temperature of the gases during the working stroke the less is the loss of heat to the walls of the cylinder. In addition, since the temperature is lower and the specific heat of the gases increases with temperature, the mean specific heat of the gases for the range covered by the rise of temperature during combustion will be decreased. Now, the lower the mean specific heat of the gases, the greater the rise of pressure produced by the communication of a given quantity of heat. Since it is the increase in pressure which forces the piston down, and hence does work, it is obvious that the greater the increase in pressure produced by a given heat supply the greater the work done during the cycle, and hence the greater the efficiency. The efficiency does not, however, increase indefinitely as the mixture gets weaker, but, instead, decreases somewhat rapidly for mixtures weaker than about 17 parts of air to 1 of petrol. The reason for this decrease is the very slow burning of such weak mixtures, so that even by advancing the spark more than usual we are unable to arrange that the whole charge shall have burnt before the piston has appreciably moved down on the working stroke. The greater the speed of the engine the further will the piston have moved before the combustion is complete, so that we should expect the efficiency curve to drop more rapidly at high speeds than at low. This effect is, in fact, quite evident from the result of the experiment shown in Fig. 30.

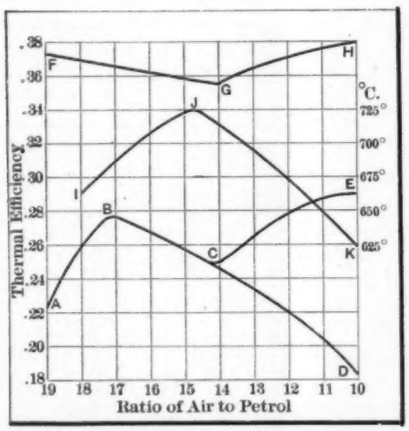


Fig. 35—Diagram showing thermal efficiency with varying percentages of gasoline and air

In the case of mixtures richer than 1 of petrol to 14 of air the combustion is not complete, some of the heat of the fuel not being liberated. By considering the quantity of heat which could be obtained by burning the carbon monoxide, hydrogen and methane found in the exhaust, and deducting this from the calorific value of the fuel supplied, we can calculate the heat actually liberated in the cylinder and then, using this value, obtain the efficiency of the engine after allowing for the effect of incomplete combustion. The amount of heat wasted for different percentages of carbon monoxide in the exhaust is shown in Fig. 34. It will be observed that when there is 10 per cent. of CO in the exhaust, 37 per cent. of the heat in the fuel is wasted on account of incomplete combustion.

On working out the efficiency, allowing for the heat not liberated, the efficiency curve for mixtures richer than 14 of air to 1 of petrol has the form shown at C E, Fig. 35. The rise from C to E is due to two effects. In the first place, as the petrol becomes more and more in excess the temperature falls, and thus the losses due to conduction to the cylinder walls decrease. In the second place, as is shown in Fig. 25, there is a rapid rise in the increase in volume on combustion for mixtures richer than 1 of petrol to 14 of air. Now this increase in volume produces an increase in pressure in the cylinder, without any corresponding increase in temperature with its accompanying losses, and, therefore, has a marked effect on the efficiency. If the efficiency for an ideal engine (variable specific heat) is worked out for different strengths of mixture, *i. e.*, heat supply per cycle, and the results plotted, we obtain the curve F G H (Fig. 35). The rise from G to F is due to decreased maximum temperature, while the rise from G to H is partly due to decreased maximum temperature and partly due to increasing expansion on combustion.

Although there is very little doubt that the temperature reached will be higher for a mixture of 1 of petrol to 14 of air than for both weaker and stronger mixtures, it would be a good thing if direct experimental proof were obtained. Now, owing to the very high temperatures reached during the explosion, temperatures sufficient to melt a platinum wire, the direct measurement of such temperatures is impossible. Owing to the expansion which takes place during the working stroke, as well as to loss to the cylinder walls, the temperature at the end of the working stroke is so much reduced as to be measurable. Hence we can measure the temperature of the exhaust gases directly after they leave the cylinder, and the values obtained by means of a platinum resist-

ance thermometer, with different strengths of mixture, are shown in the curve, I J K, Fig. 35. It will be noticed that the temperature rises to a maximum for a mixture of 1 of petrol to 14.7 of air. Now, if the exhaust temperature is a maximum for this strength of mixture we may infer that the temperature throughout the stroke is also a maximum, and hence the explanation of the shape of the efficiency curve given above is supported.

Since it has been shown that if we restrict ourselves to the Otto cycle it is not possible to obtain any very striking increase in efficiency, it is interesting to see whether it seems likely that greatly improved efficiency could be obtained by employing a different cycle.

A study of the numbers already given shows that more than half the energy supplied in the form of fuel is discharged in the hot gases of the exhaust. One way of decreasing the loss on this account would be to carry the expansion on the working stroke further than is done in the Otto cycle. We are limited, of course, as to the amount of expansion possible since the pressure must not be allowed to drop below atmospheric pressure. If we continue the expansion till the pressure in the cylinder falls to atmospheric pressure, then the indicator diagrams obtained on an ideal air-cycle engine, an ideal variable specific heat engine and in an actual engine would have the form shown in Fig. 36.

The efficiency obtained and the heat distribution in such a case are shown in the following table:

	Final volume	Mean effective pressure lbs. per sq. in.	Efficiency	Work per cycle ft. lbs.	Work per cycle, Otto ft. lbs.	Difference ft. lbs.
Ideal engine, variable specific heat.	3.5	38	.47	538	410	128
Actual engine.....	2.7	30	.30	344	285	59

Expansion carried to atmospheric pressure.
Compression ratio = 4.7.
Heat supply per cycle = 1,150 ft. lbs.
Initial volume of charge taken as unity.

It will be seen that carrying the expansion to 2.7 times the original volume only gives an additional 59 foot-pounds of work. Hence it is quite certain that, allowing for the increased friction, such an engine would not give as high a brake-horsepower as it would if the expansion had been stopped at the original volume. A further practical objection is that an engine having such a large expansion would be very heavy for the power developed, the mean effective pressure only being 30 pounds per square inch as against 84 pounds per square inch on the Otto cycle. It is conceivable that some way of obtaining increased expansion other than by means of a piston, say in a turbine, may be developed in time, but even then, as the above calculations show, the gain cannot be very great.

One method of obtaining increased efficiency is to employ higher compression; but, as has already been mentioned, it is impossible to compress a mixture of air and petrol above a certain amount without producing pre-ignition. Hence if we wish to use higher compressions it will be necessary to compress the air alone and then add the petrol at the top of the stroke, just as is done in the Diesel engine. It is very doubtful, however, if any very material increase of efficiency would be obtained in this way, and the complication introduced into the engine, as well as the increased weight, would preclude its adoption either in a motor car or aeroplane. It would thus appear that such modifications of the Otto cycle as I have considered do not promise to afford much improvement, and, as we have seen, the present-day engines working in the Otto cycle do give about 75 per cent. of their maximum efficiency, so that at most an improvement of 25 per cent. is possible. It must in this connection, however, be remembered that it is only when an engine is well designed and run with a correctly proportioned mixture of air and petrol and with a properly timed spark that such relative efficiencies as 75 per cent. are attainable. There is no doubt that, in the case of the majority of petrol engines which are in general use, these conditions are by no means fulfilled and hence the efficiencies obtained are much lower.

I have, in these lectures, given a somewhat rapid account of the methods by which we can obtain some insight into what goes on inside the cylinder of a petrol engine, and have given some of the results obtained so far. Much remains to be done before our knowledge is at all complete, but the subject is one attracting much attention, and many workers, both engineers and physicists, are attacking the problems, so that before long I have no doubt much that is now doubtful will be cleared up.

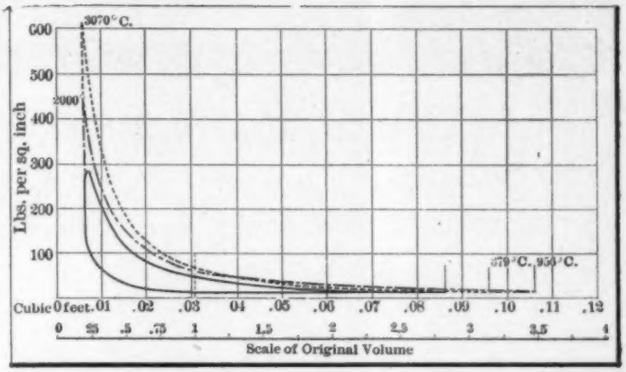


Fig. 36—Resultant pressures due to compression, explosion, and expansion for given volumes as shown, with equivalent volumetric measurements in cubic feet.

Radiator Trouble

Determining the Size of the Radiator Based Upon the Horsepower Rating of the Motor Is Futile

EARLY practice, guided by synthetic formulæ and a surfeit of inexperience, led to the use of radiators on many automobiles, which in after service proved to be a decided misfit. The conditions that must govern the wise engineer when he fixes upon the size of a radiator for a given motor may be set down briefly as follows:

(a) The thermal efficiency of the motor must be known.

(b) The amount of fuel that can be burned to carbonic acid and water is a factor.

(c) The stray heat units must be traced to their destination.

Since the value of the fuel is measured in heat units and all of the energy so measured, if it is not turned into mechanical work, must be disposed of in such a way as not to cause trouble, it remains to find out how much of this energy falls to the lot of the radiator to handle and the difference in sensible temperature under which the heat must be disposed of. For every 100,000 heat units furnished by the fuel and burned to finality it is a good motor that will turn 16,000 of them into mechanical work. It is not a bad motor that sends 50,000 of these heat units into the cooling water, in which event the radiator must unload 50,000 heat units to the willing air as it glides over the surfaces in the interstices of the radiator. The early mistakes in cooler practice followed the assumption that the thermal efficiency of all motors is substantially the same. After events proved that there was a wide divergence; moreover, there is considerable opportunity for serious trouble, even if the thermal efficiency is, say, 16 per cent., which means that 84,000 mischief-making heat units must be watched and guarded against.

These very possibilities show ample reason for wanting to know more about it. If a radiator is designed for a motor that only delivers 30,000 out of each 100,000 heat units to the cooling system and this radiator is transferred to a motor that permits 60,000 out of each 100 000 heat units to go to the water, the figures show that the radiator will be just half big enough.

The reason why some motors deliver more of the stray heat to the water jacket than is transferred in other examples is due to the difference in flame-swept surface influenced by other thermic relations. Restricting the internal surface of the combustion chamber of the motor reduces the path of transfer of heat units to the water jacket and vice versa.

Lubrication Problems

THE CAMEL MAY GO EIGHT DAYS WITHOUT LUBRICANT, BUT THE AUTOMOBILE IS CONSTRUCTED ON SOMEWHAT DIFFERENT LINES

THERE is nothing so disconcerting to the autoist as to hear a persistent squeak, and one that cannot be located, coming from beneath the hood of the car. Of course, it may not come from the hood at all, and nothing less than the stethoscope would seem to be able to discover the fault. No doubt if this instrument were placed on every square inch of metal of the car the cause might be located. But there is no necessity for this on a well-built car provided the lubrication is properly carried out. The body and its fittings are often the cause of these mysterious squeaks; for instance, the mud guards may rub against the frame, or the top sockets, having become rusty with exposure, may give out sounds as the bumps of the road move the upright arms in them. Such trivialities are easily remedied and once put right will not occur again.

A squeak is an ominous sign and should never be disregarded; it is like some great event casting a shadow before it. Should it emanate from some such cause as above instanced it is no reason why it should be disregarded the next time it occurs. The rule the autoist should lay down for himself is that it emanates from want of lubrication. Such noises do seem to have the knack of putting themselves in evidence at inopportune times—perhaps just a few miles from home and when one is least inclined to get down to attend to it. Procrastination is going to be a thief if the Good Samaritan neglects his duty. As plainly as any dumb animal can ask, the car is craving for oil. And why deny it? If a car that starts out lively in the morning shows signs later in the day of sluggish digestion there is one patent remedy known to all, and that is oil. One has but to drop into the first repair shop to discover that the majority of repairs can be traced to one cause—want of oil. There is no excuse for the novice if he has trouble through underlubrication, and the first thing that the maker of a car will ask if a part is broken is: "Did you lubricate it properly?" In the majority of cases this is the root of the evil. It is not sufficient to oil up a car regularly on the off chance that the oil "gets there"; it is necessary that the channel should be free and the oil of the right consistency for the size of the pipe. A pipe that may be large enough to convey gasoline to the carbureter would be altogether too small if heavy oil were used for engine lubrication; and, again, should the vent to allow the gases that find their way to the crank chamber become partially stopped up, some of this back-pressure may find its way up the oil pipes and stop the flow of oil down them.

The majority of engines of the present day have some anti-friction metal liners in the main bearings, and these serve two purposes—the first being to reduce friction; the second, that should the friction become too great through the heat generated by want of oil, this lining metal, having a low melting point, will run and incidentally cause such a knocking that it will be impossible to drive unless one is deaf. If it were possible to drive with the eyes shut, there is no finer way to tell how a car is pulling; and it is really a pleasure, after the rudiments of driving have been mastered, to listen to the rhythmic beat of the motor. Then you begin to think of the car as a friend of man and fondly pet the part that makes the wheels go round rather than pat it externally and groom its glossy coat and count the number of scratches on the varnished panels. There is a saying that the way to a man's heart is through his stomach, and to get the best out of the car, "feed the brute" with oil. The gasoline motor has different ways of showing its displeasure, and two of these may be seen in the accompanying illustrations. Fig. 1 represents a connecting rod R1 and the lower half B1, and half the liner L1, or rather all that is left of it. The remains of the bearing were found in the lower half of the base chamber without a drop of oil in it. Here the metal had melted from the white metal linings and run almost in a stream, as the particles were found in a lump A, besides several small particles B, Fig. 2.

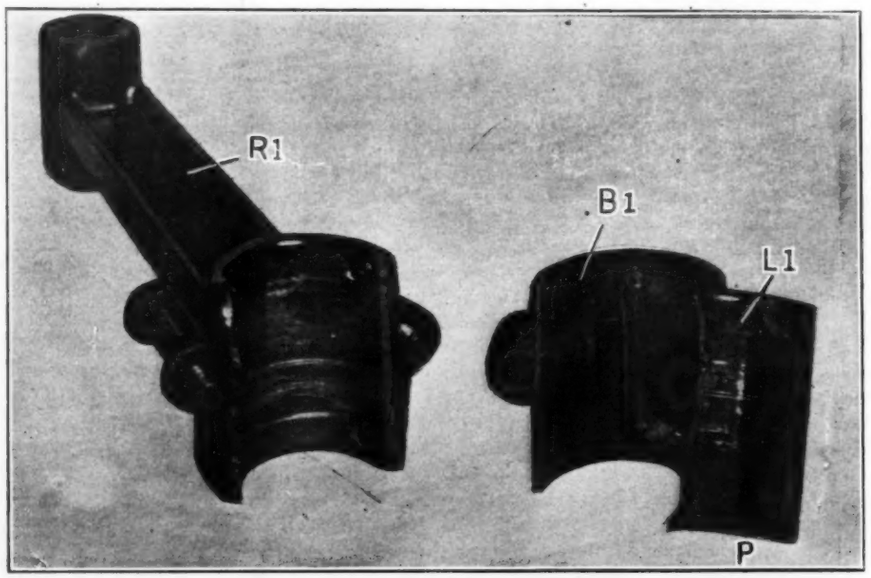


Fig. 1—Showing burnt-out bearings due to insufficient lubrication

This is a mild form of trouble comparatively speaking. For instance, Fig. 3 represents the same trouble in a different light. In this case there must have been a sudden seizure of the bearing on the shaft which burst the bolt B1 and lower half of the bearing B11, and as something had to go, the weakest part gave way. In this case the manufacturer could not be held responsible for the omission of the driver. Had he had oil in his engine there would have been no seizure and consequently no hole in the base chamber. This was caused by the connecting rod C1 being freed from the crankshaft and being hit by same on the next revolution, the force being such as to drive it through the base E1, and a very lucky break, too. The connecting rod has been bent out of the perpendicular to the amount shown, allowing for the small amount of side-swing.

While it is the aim of every designer of an automobile to so contrive that the lubricating problem will be minimized, the fact remains that no method has as yet been discovered by means of which it will be possible to turn a car over to a user and say to him, "Forget all about the oiling question." It was hoped

at one time that annular type ball bearings would thrive in the absence of lubricant, and so they will, to a greater or lesser extent, but they will last very much longer if they are lubricated than they will if they are permitted to run dry. It was found in the course of events that plain bearings will sustain under pressures as high as 1,500 pounds per square inch if the service is intermittent, as it is in the motor, due to reciprocation of the members rather than to continuous rotation. Even the camshaft belongs in the class involving intermittent pressures, because the load comes on intermittently. Persistent experimenting seems to have evolved a substantial array of data that proves quite conclusively that the real problem of lubrication has to do with an unbroken oil film rather than with pressure.

It is the duty of the automobilist to supply a sufficient quantity of good lubricating oil to assure that the film will not be broken. It is also necessary to appreciate the fact that even with good lubricating oil the film will be broken if a little water squeezes in. Following along this line of reasoning for a moment, it leads rather forcibly to the conclusion that the practice of cleaning out cylinders, using kerosene oil, or other liquids that are not good lubricants, leads to the contamination of the lubricating medium and to the very difficulty which it is necessary to avoid if the motor's bearings are to be kept free from harm. But a very few drops of kerosene oil will be required to so reduce the value of the lubricant that the oil film will be ruptured and the spindles will be let down on the journal brasses, which they will seize.

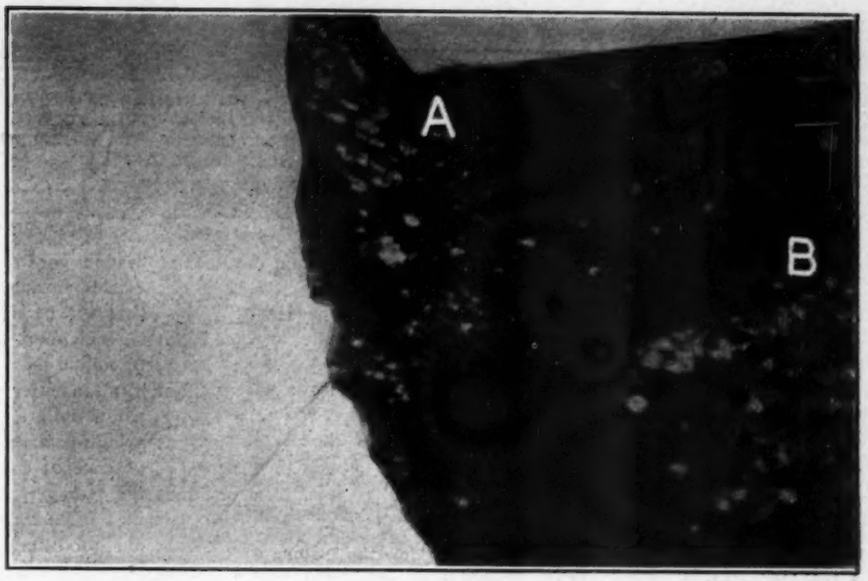


Fig 4—Showing the metal run out of the bearing into the base chamber, whence it was recovered

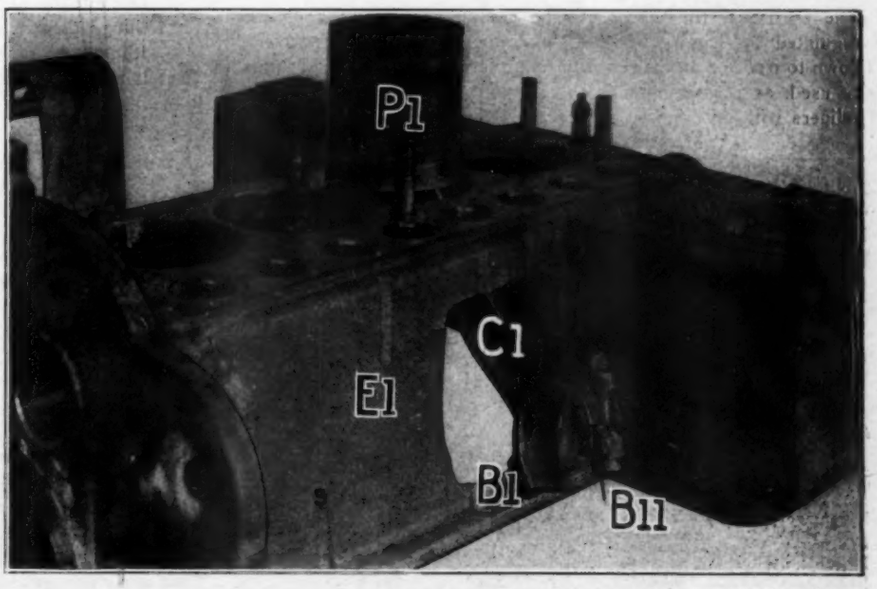
Stray Thoughts

On "the Ambitions of the Automobile Industry" or What They Ought To Be

SOME very fine problems are involved in making 10,000 automobiles with a capital of $10,000 and making them all alike and selling them at a profit at $1,000 for each and having each of them better than anything that could be bought for four times more money four years ago, and all those things. But there has to be division of interests in this world, just as there has to be division of labor, unless one is willing to split oneself up into atoms. An individual's interests cease distinctly when nearly all the things that are done are aimed at money-making for the other fellow and every improvement is pushed aside because it interferes with the regular routine of manufacture. The other fellow is vitally concerned, of course, as are all those who are to share in the profits. A little glow of satisfaction can even be derived from reflecting that the time is drawing nearer when every farmer and every expressman will be able to buy a car to help him out in his business, and any one can appreciate that every now and then this automobile production under high pressure uncovers some new way of mixing or of working steel which eventually may be of benefit to the engineer, who is doubtless willing to pick up and utilize these incidental gains as soon as they are ripe.

Meanwhile it would doubtless interest the public—the motoring portion, at least—much more to learn that, for example, a plan had been devised for doing away with the gasoline tank. Some one might get up a standard size of gasoline can—to hold three gallons, say—and have that sold all over like sugar, only sealed; and provide a couple of cradles with clamps for holding these cans in each car and an attachment with a nut and a pipe or anything to enable one to draw direct from either can. When one can was empty one could start drawing from the other and at the next stopping place simply exchange the empty can for a full one.

There would be decidedly less bother pouring gasoline or getting it dirty or full of water, and there would always be some on tap. The cans could be removed at home and the owner could store his car where he pleased without getting into trouble with the insurance people.



Disastrous effects may be caused by the bearing seizing and breaking a bolt, with results similar to those here depicted

It Stands to Reason

THAT A PURCHASER OF AN AUTOMOBILE IS IN THE GRAVEST DANGER OF TAKING TITLE TO WHAT HE CANNOT GENERATE A PERMANENT LIKING FOR WHEN HIS MIND BECOMES WRAPPED UP IN A SINGLE THOUGHT

That a tomato-can may be a satisfactory carbureter, but that the price to be paid should be on a tomato-can basis.

That purchasing an automobile is like venturing on the sea of matrimony; the sterner side is hidden; the smile might rub off.

That the idea of the mother-in-law being an index of the wife works out in automobiles; look at the service which is being rendered to ascertain the character of the service that you will experience.

That wisdom goes on a vacation while a man of little sense purchases an automobile based upon the envy that his neighbors will be able to support.

That the neighbors get the laugh on the man who wants them to coddle the envy that he pays so much to deliver.

That it is far better to purchase a modest automobile and reserve a few dollars for purposes of maintenance.

That a high-powered motor, so-called, is a mess of junk in the absence of a good carbureter.

That the average purchaser is over-awed by size; why not invest in a mountain; it comes by the acre.

That one good magneto is worth a bushel of poor ones.

That there are hundreds of automobiles delivering poor service for want of a good spark-plug.

That automobilists fail to appreciate what it means to keep a high voltage from jumping out of bounds; keep the spark-plugs clean; keep oil away from the wiring.

That excesses of lubricating oil are at the bottom of a large number of motor troubles.

That even the muffler will foul up in time if too much lubricating oil is used.

That it is a shame to pay so much for lubricating oil and then waste nearly all of it.

That profuse lubrication, while it sounds good as a phrase, is likely to end in a spree.

That it is not good for bearings to go on a spree.

That the excesses of lubricating oil dissolve the tires, accumulate dirt, and invite the owner of the automobile to keep from soiling his garments.

That simplicity does not consist in leaving some of the parts off an automobile and then going around bragging about the good qualities that it has a monopoly of; the best of the good qualities might reside in the parts that are left off.

That the "extras," so-called, may be necessities, in which event they are only to be classed as extras when the purchase is being made.

That things thrown in for good measure might just as well be left out as far as good value in them is concerned.

That it is better as a rule to buy what is needed; the quality will then be what is wanted, and the price, all points considered, will be the lowest.

That it is proper to include everything for comfort and convenience; when a trip is to be made in an automobile, it is just as desirable to be comfortable as when a journey is to be endured in a house-boat.

That it is a simple matter to dismiss the purchase of necessities until a later date; but it might be too long deferred and the cost of neglect would then have to be faced.

That proper lighting facilities must be procured whether they come extra or regular; get the best; make the purchase while the subject is up; why make two bites of a cherry?

That a lighting dynamo is a very desirable adjunct to a good automobile; it is a constant and reliable source of an adequate supply of electrical energy.

That acetylene lighting is admirably accomplished when a gas-tank is used; the cost is low enough; facilities for exchanging filled for emptied gas-containers must, of course, be near at hand.

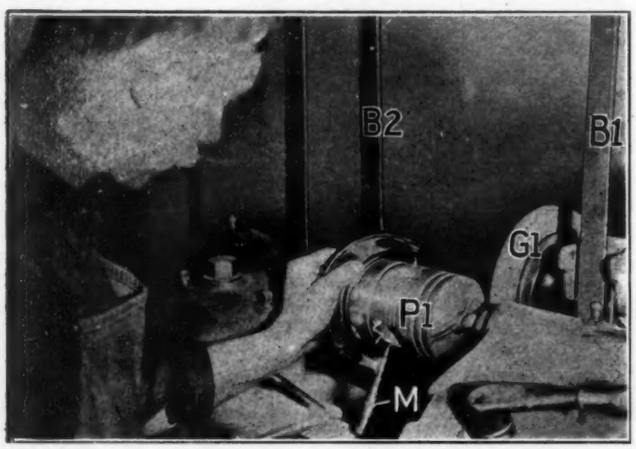
That acetylene generators are so much refined that any automobilist of ordinary intelligence will be able to make them work satisfactorily—get a good generator.

Fitting New Pistons

Explaining How the Pistons Are Treated from the Blank to the Finished Article

IT avails about as much to run an engine with the pistons a bad fit in the cylinders as to attempt to play "Hamlet" with the principal character left out. The life and soul of the motor lie in proper compression, which can only be attained if the pistons are a snug fit. Opinions differ as to the exact amount of clearance between the cylinder and piston required to arrive at this, but if the clearance is more than the outside estimate nothing will rejuvenate the motor unless new pistons are fitted.

As a temporary remedy new rings are often tried, but it is so much money thrown away to thus fuss around. Go to the root of the trouble, and if the car is to be used at all get new blanks from the makers, if possible 1-4 inch more in diameter than the old ones. Presuming the cylinders have been lapped—that is to say, evened up to a uniform diameter—this measurement should be carefully taken and the piston fitted up for grinding in the manner shown in the illustration. The polish given by the grinding method does away with the long process of running in the part if ordinary turning is resorted to. The grinding wheel G1 rotates clockwise, driven by the belt B1, while the piston P1 turns in the opposite direction, driven by the belt B2. The travel of the wheel can be set automatically or can be regulated by hand. For this class of work, where precision down to 0.001 of an inch is required, micrometer calipers M1 must be used, as it is impossible to ascertain with the ordinary bow calipers with any degree of exactness the thickness of the work.



Showing method of grinding pistons for cylinders that have been lapped out

Paint and Varnish Refinements

M. C. Hillick Discusses the Problems of Finishing for 1911

PUBLICATIONS devoted to the interests of automobile manufacturing and marketing have during the past few weeks been busy imparting information to their readers concerning changes in body construction, suspension, type, motors, propulsion and so on of the 1911 car. And while all these changes have been arranged for, the painters and finishers, whose work is, more than anything else, the visible thing which helps sell the car, have not been idle. As a matter of fact, when Milady and her escort visit the Madison Square Garden Automobile Show in January she will find original and unlooked-for color creations, striping effects to move her into an ecstasy of delight, and a finish sure to evoke her unstinted admiration.

For, verily, all these art matters have been provided for by the master of the paint shop and the varnish room.

In the matter of colors it is true that the great range of pigments—sufficient, indeed, to confuse the mind of the layman—all, or chiefly, radiate from a comparatively few members, such as, for example, green, blue, red, yellow, brown and gray. The shades and tints, and the modifications, made up from using the above as basic colors, are, fairly, as the sands of the sea. Every season brings its new crop of colors and the season of 1911, as the coming automobile exhibitions will show, is to be no exception to the rule.

For example, among many new colors to bid for popular approval will be found Detroit and Hudson gray, auto maroon, Niagara and Roman green, Detroit blue, Indian and fire blue. But it will not matter so greatly precisely what the colors are called so long as they have the tone, the brilliancy of effect, the capacity to elicit admiration. This last, in fact, is the real test of color value as it is tried out on the showroom floor and in the salesroom.

It may possess other rare good qualities, but, failing in this, prove a loser.

The prospective buyer at the coming shows and elsewhere may expect, and look for, and even demand, some effects in colors which he has not hitherto enjoyed, namely, the proper display of colors with reference to one another. This matter has not heretofore been worked out on the automobile surface to the extent the painters have been capable of, and as a result we have had examples on the heavier type of car, notably the limousine, of colors jumbled together in such a way and in such direct violation of good taste and the law of artistic color effects that the entire color scheme has gone by the boards as crude and amateurish, as it deserved to. As, perhaps, nowhere else, the law of harmony, of seemly contrasts, must be lived up to the very letter on the rich and ample automobile surface. Otherwise the effect will be about as ludicrous as anything the imagination can conjure up.

The automobile surface showing the minimum number of colors, and those colors chosen for their capacity, above everything else, to display and accentuate the charms of each, will prove—indeed is proving—other things being equal, the one most eagerly sought for by buyers.

The great touring cars showing, as a case in point, two colors simply and elegantly displayed, each pigment adding to the attractiveness of the other, are commanding, and are destined to command, an amount of attention from the people whose attention is valuable, which more colors, or the same number of colors unfortunately displayed, can in nowise be expected to command.

The striping of the automobile is a part of the painter's work which may make or mar the appearance of the car. Too much striping is even worse than none at all. As in the employment of the minimum number of colors for the surface, so in the employment of the single, or, at most, the double lines of striping, lies the development of the most fetching effects. Strictly speaking, striping is intended to "set-out," to heighten the effect of the body color.

Coming Events

CALENDAR OF FUTURE HAPPENINGS IN THE AUTOMOBILE WORLD THAT WILL HELP THE READER KEEP HIS DATES STRAIGHT—SHOWS, ANNUAL MEETINGS AND OTHER FIXTURES

Dec. 31-Jan. 7, '11.	New York City, Grand Central Palace, Eleventh Annual International Automobile Show.
Jan. 2-7.....	New York City, Hotel Astor, Annual Importers' Salon.
Jan. 7-14.....	New York City, Madison Square Garden, Eleventh Annual Show, Pleasure Car Division, Association of Licensed Manufacturers.
Jan. 11-12.....	New York, Annual Meeting, Society of Automobile Engineers.
Jan. 14-28.....	Philadelphia, Annual Show, Philadelphia Licensed Automobile Dealers' Association, First and Third Regiment Armories.
Jan. 16-21.....	New York City, Madison Square Garden, Eleventh Annual Show, Commercial Division, A.L.A.M.
Jan. 16-21.....	Detroit, Mich., Tenth Annual Show, Detroit Automobile Dealers' Association, Wayne Pavilion.
Jan. 16-21.....	Milwaukee, Wis., Annual Show, Milwaukee Automobile Dealers' Association, Auditorium.
Jan. 28-Feb. 4....	Chicago Coliseum, Tenth Annual National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Pleasure Cars and Accessories, Exclusively.
Feb. 6-11.....	Chicago Coliseum, Tenth National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Commercial Vehicles, Pleasure Cars, Motorcycles and Accessories.
Feb. 6-12.....	Buffalo, N. Y., Ninth Annual Show, Automobile Trade Association of Buffalo, Broadway Arsenal.
Feb. 13-18.....	Washington, D. C., Annual Show, Convention Hall.
Feb. 13-18.....	St. Louis, Mo., Fifth Annual Show, Coliseum.
Feb. 14-19.....	Kansas City, Mo., Annual Show, Motor Car Trade Association.
Feb. 15-18.....	Grand Rapids, Mich., Annual Show.
Feb. 18-25.....	Minneapolis, Minn., Annual Show, Minneapolis Automobile Show Association, National Guard Armory.
Feb. 18-25.....	Brooklyn, N. Y., Annual Show, Brooklyn Motor Vehicle Dealers' Association, 23d Regt. Armory.
Feb. 18-25.....	Binghamton, N. Y., Second Annual Show, Binghamton Automobile Club and Chamber of Commerce, State Armory.
Feb. 18-25.....	Newark, N. J., Fourth Annual Show, New Jersey Automobile Exhibition Co.
Feb. 20-25.....	Cincinnati, O., Annual Show, Cincinnati Automobile Dealers' Association.
Feb. 20-26.....	Omaha, Neb., Annual Show, Omaha Automobile Association.
Feb. 21-25.....	Baltimore, Md., Annual Show, Automobile Club of Maryland, Fifth Regiment Armory.
Feb. 24-27.....	New Orleans, La., Annual Show, New Orleans Automobile Club.
Feb. 25-Mar. 4....	Toronto, Ont., Automobile Show, Ontario Motor League.
Feb. 27-Mar. 4....	Kansas City, Mo., Fifth Annual Show, Kansas City Automobile Dealers' Association, Convention Hall.
Mar. 4-11.....	Boston, Mechanics' Building, Ninth Annual Show, Licensed Automobile Dealers' Association.
Mar. 14-18.....	Syracuse, N. Y., Third Annual Show, Syracuse Automobile Dealers' Association, State Armory.
Mar. 14-18.....	Denver, Col., Annual Automobile Show, Management Motor Field, Colorado Auditorium.
Mar. 15-18.....	Louisville, Ky., Annual Show, Louisville Automobile Dealers' Association, First Regiment Armory.
Mar. 18-25.....	Pittsburg, Annual Show, Pittsburg Auto Show Association (Inc.), Exposition Hall.
Mar. 25-Apr. 1...	Buffalo, N. Y., Fourth Power Boat and Sportsmen's Show, Sixty-fifth Regiment Arsenal, Buffalo Launch Club.
Mar. 25-Apr. 8...	Pittsburg, Fifth Annual Show, Duquesne Garden, First Week, Pleasure Cars; Second Week, Commercial Trucks. Automobile Dealers' Association of Pittsburg, Inc.
Apr. 1-8.....	Montreal, Can., Automobile and Motor Boat Show, Automobile and Aero Club of Canada.

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H. M. SWETLAND, President
A. B. SWETLAND, General Manager
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STANDING on any corner of a business thoroughfare watching automobiles go by affords food for serious reflection to the man who studies the economic problem, and among the things which come to the surface mention may be made of spreading wheels and the poor alignment of the front with the rear wheels. When the snow is on the ground and the average automobilist finds by inspection that the front and rear wheels do not track with each other he may take it as a sign that the alignment is poor. Considerations of economy are founded on the proper alignment of the front with the rear wheels, although it is considered good practice to have the front wheels toe in slightly. In dealing with the lining up of wheels in THE AUTOMOBILE of this week the methods in vogue in some of the garage repair shops are illustrated, and since the process involved is relatively simple, one would fail to understand why any automobilist should throw away 25 per cent. of the value of his tires rather than to align the wheels.

* * *

ALUMINUM, as it is used for crankcases and transmission gear boxes, is supposed to be of the first quality, but if an automobilist has the misfortune to become "shipmate" with a broken crankcase he will at once take a keen interest in the problem involved and he will have to determine for himself whether or not he will call upon a repairman or procure a new case from the maker. Under the head of "Practical Repairing" this problem is discussed at some length in THE AUTOMOBILE this week, and quite a little space is devoted to that part of the subject which will help the automobilist to understand whether or not the quality of the material present in the event of a broken crankcase will be such as to encourage the making of a repair. If the material in any given case passes a critical inspection as to its physical characteristics it will then be time enough to utilize the oxy-acetylene flame and such other facilities as may be had with a view to welding the broken parts.

* * *

COMMUNICATIONS continue to come to the Editor bearing upon the subject of the mathematical determination of the horsepower output of internal combustion motors as they are used in automobile work. It is almost strange that anyone would regard an empirical formula as having any great virtue, particularly in view of the fact that a plurality of companies are paying real money to engineers of considerable reputation for no better purpose than to design motors so that they will deliver power on a satisfactory basis. If the whole subject is encompassed in an empirical formula that in itself is so simple that an office boy might commit it to memory in twenty minutes, it is past understanding why a pay-roll should be considerably bulged for the purpose of recompensing men of accentuated skill. As a matter of cold hard fact the formula tells nothing.

* * *

WHETHER or not an automobile motor will be highly efficient in the delivery of mechanical power or most efficacious as a stove or heater depends entirely upon the thermic balance, and judging from the character of discussion which emanates from even high sources it is not believed that the thermic relations are given the serious consideration to which they are entitled. But there is no reason why even an automobilist might not make himself quite familiar with the reasons why a motor will either deliver power or act like a stove, for instance; in other words, an ordinary kitchen range is looked upon as being a faithful servant if it furnishes heat. The stove differs from the motor when the latter is working properly, in that mechanical power is the product, but when a motor is in poor health it is mostly noted for its ability to imitate the kitchen range. All these thermic relations are being clearly expounded in THE AUTOMOBILE under the head of "Cantor Lectures," and the automobilist who wishes to know the difference between the motor in his automobile and the stove in his kitchen is in a position to acquire the information.

* * *

RECOUNTING the cost of a tour in THE AUTOMOBILE this week, involving a distance of 4,309 miles, taking thirty-nine traveling days, brings to light several important details, as, for illustration, the average traveling was on a basis of 110 miles per day. The trip was made over a great variety of roads between Freehold, N. J., and Billings, Mont. The total of the expenses of the trip was $3,507.55. A casual examination of the items of expense would lead one to the conclusion that the hotel bills were rather frequent and too large to suit the pocketbook of a man of ordinary means. The tire bills are also something to notice, and gasoline at 20 cents per gallon seems too high. It would seem possible for a man who first makes suitable preparation and thereafter drives his own automobile to conclude a tour of this magnitude well within the cost in this particular case.

News Section

HAPPENINGS OF THE WEEK IN VARIOUS SECTIONS OF THE COUNTRY AS GATHERED BY THE 84 SPECIAL WRITERS AND CORRESPONDENTS OF "THE AUTOMOBILE"

S. A. E. Program to be Interesting—News of the Shows Throughout the Country—New Jersey Automobile and Motor Club Quits A. A. A.; Louisville Club Will Follow Suit; Belated Action of A. A. A. on Disqualifications—Refinements to be Seen at the Paris Salon—News of Maker and Dealer in Many Fields—Peeps Through Auto Goggles at Foreign Lands—Short Personal Items of Interest to the Trade, Etc.

S. A. E. Program to Be Interesting

ASSEMBLING in New York when the metropolis is seething with automobile interest, the Society of Automobile Engineers will hold its annual meeting January 11-12, 1911. The sessions will be held in the quarters of the Automobile Club of America.

The opening session will probably be along the usual lines, including an opening address by President H. E. Coffin, followed by election of members and reports of the treasurer and council. Reports on the election of officers and a discussion of proposed amendments to the constitution of the society will probably conclude the session.

The first professional session is scheduled for the afternoon. According to reports, it will include papers on "Electro Steel," by Joseph Schaeffers; "Physical Facts Relating to Metallurgy," by Radclyffe Furness; reports of the Committee on Standards, including those of divisions on the various metals, parts and generally on standardization. A. L. McMurtry, who has been particularly active in contest work from the technical viewpoint, will deliver an address on "Contest Rules that Affect the Engineer." The matter of contests will be treated in two or more additional papers, one of which will be by Chester S. Ricker, who will discuss timing and coaching.

Wednesday evening will be devoted to a reception at which the retiring president and the president-elect will speak. This will be followed by the annual dinner and entertainment.

The last day of the meeting will be very busy. A professional session will convene at 9 o'clock, at which a number of important subjects will be covered. Logan Waller Page, of the Department of Agriculture, will treat of the construction of highways for motor traffic. "Leaf Springs," E. K. Rowland; "Valve Systems," E. P. Batzell; "Hot-Roller Gears," H. N. Anderson, and "Commercial Gasoline," by F. H. Floyd, are among the subjects that are reported to have place on the program of the session.

Thursday afternoon's professional session will be occupied by half a dozen addresses, including the following: "Bearing Metal Tests," S. P. Wetherell, Jr.; "Test of Franklin '20' Air-cooled Car," L. R. Evans; "Development of Grinding Wheel," G. N. Jeppson; "Methods of Grinding," John C. Spence; "Frictionless Friction Drive," C. E. Duryea; "Fire Protection," N. B. Pope; "Multi-point Ignition," Otto Hains.

"Commercial Vehicles" will be the subject of the evening session. "Standardization" will be treated by W. P. Kennedy; "Vertical Motors under Foot Boards," by B. D. Gay; "Proper Speed," by P. H. Breed; "Chain Drive for Trucks," by the same speaker; "Gasoline-Electric Transmission," Alex. Churchward; "Foolproofing the Commercial Car," A. J. Slade; "Co-operation between the Electric Vehicle Maker and Central Station," Robert McA. Lloyd; "Multiple Uses of Municipal Service Machines," John M. Mack; "City Merchandise Transportation," Hayden Eames; "Production of Commercial Vehicles," Charles E. Hadley; "The Ampere-hour Meter," C. A. Lamphier, and several other interesting papers will be presented by eminent engineers.

It is understood that many other subjects may be introduced.

Stoltz Reorganizes Croxton-Keeton Co.

J. P. Stoltz, of New York, and H. D. Michaels have effected a reorganization of the Croxton-Keeton Motor Company, of Massillon, Ohio, which has been in the hands of the courts since last Summer. The name of the company has been changed to the Croxton Motor Company, capitalized at $250,000, of which $150,000 will be common and $100,00 7 per cent, preferred stock.

The transaction was completed last Saturday, and the new management took hold immediately.

Production had not been stopped completely during the receivership, and all the new concern had to do was to put on more men. After his return to New York Mr. Stoltz informed THE AUTOMOBILE that he expected to have about 100 men working by the first of the year and that a still larger force might be put on in the near future.

H. A. Croxton, founder of the company, will remain as president and general manager. Mr. Croxton is favorably known to the trade. Mr. Stoltz is vice-president and will have charge of the Eastern distribution, with headquarters at New York. Mr. Michaels is secretary and treasurer of the reorganized company.

The amount of cash involved in the transaction was $75,000, and a settlement with the creditors had been previously effected on a basis of 25 per cent.

The holders of the preferred issue of the Croxton-Keeton company will receive an equal number of similar shares in the new concern. The company has filed articles of incorporation at the Ohio capital. The incorporators, besides the three officers heretofore named, are: W. E. N. Hemperley and Charles P. L. McLain.

In commenting upon the situation, Mr. Stoltz said: "Conservatism will be the keynote of our activities. For the present practically the same line will be manufactured, but a number of improvements are being considered. The record of the car speaks for itself."

All idea of moving the factory from Massillon to some other location in Ohio has been abandoned.

Storage Battery Displaces Horse

Gould storage battery cars have been installed on the Twenty-eighth and Twenty-ninth street cross-town line in New York. The new cars take the place of the antiquated, ark-like, horse-drawn cars that have proved such a joke to rural visitors in New York for ten years.

The new cars so far have proved satisfactory and a vast improvement over their ancient predecessors.

News Notes of the Coming Automobile Shows

AFTER the gasoline pleasure vehicle section of the A. L. A. M. show closes at Madison Square Garden, the commercial or freight vehicles will have their innings. The truck section will exhibit in practically the same decorative surroundings as were used by the pleasure cars and the appended list of exhibitors indicates that this section will prove the greatest of its class ever attempted.

Special program features are being arranged for the week which will attract a big attendance, in the opinion of those who have charge of the show. A complete and official list of those who will show trucks, electrics and accessories is as follows:

MAIN FLOOR

1a F. B. Stearns Co.
2a R. L. Morgan Company.
3a Pierce-Arrow Motor Car Co.
4a The Waverly Co.
5a Knox Automobile Co.
6a Hupp-Yeats Electric Car Co.
7a Peerless Motor Car Co.
8a Metzger Motor Car Co.
9a The Autocar Company.
10a Reliance Motor Truck Co.
11a Rapid Motor Vehicle Co.
12a Alden Sampson Mfg. Co.
13a Grabowsky Power Wagon Co.
14a The Lansden Company.
15a Studebaker Automobile Co.
16a The White Company.
17a Packard Motor Car Co.
18a Mack Bros. Motor Car Co.
19a American Locomotive Co.
20a General Vehicle Co.
21a Anderson Carriage Co.

ELEVATED PLATFORM

101a Buick Motor Co.
102a Cartercar Company.
103a Pope Mfg. Co.
104a Daimler Import Co.
105a H. H. Franklin Mfg. Co.
106a Reo Motor Car Co.
107a Willys-Overland Co.
113a Brush Runabout Co.
114a Atlas Motor Car Co.
115a Randolph Motor Car Co.
116a W. H. McIntyre Co.
117a The Garford Co.
118a Ward Motor Vehicle Co.
119a The Kissel Motor Car Co.
122 The Goodyear Tire & Rubber Co.
123 The Whitney Mfg. Co.
124 The Veeder Mfg. Co.
125 The Hartford Rubber Wks. Co.
126 The Badger Brass Mfg. Co.
127 The B. F. Goodrich Co.
128 The Diamond Rubber Co.
129 C. F. Splitdorf.
130 Gray & Davis.
131 G & J Tire Co.
132 Morgan & Wright.
133 National Carbon Co.
134 Light Mfg. & Fdy. Co.
135 Baldwin Chain & Mfg. Co.
136 Phineas Jones & Co.
137 A. O. Smith Co.
138 National Tube Co.
139 Diamond Chain & Mfg. Co.
140 The Jones Speedometer Co.
141 N. Y. & N. J. Lubricant Co.
142 C. A. Mezger, Inc.
143 Weed Chain Tire Co.
144 Continental Rubber Works.
145 Wheeler & Schebler.
146 Pennsylvania Rubber Co.
147 Remy Electric Co.
148 Consolidated Rub. Tire Co.
149 The Randall-Faichney Co.
150 The United States Light & Heating Co.
151 Republic Rubber Co.
152 The Conn. Tel. & Elec. Co., Inc.
153 The Chandler Co.
154 Columbia Nut & Bolt Co., Inc.
155 Coes Wrench Co.
156 Hartford Suspension Co.
157 Edmunds & Jones Mfg. Co.
157a Adam Cooks Sons.
158 Morrison-Ricker Mfg. Co.
159 J. H. Lehman Mfg. Co.
161 Chas. E. Miller.
162 A. W. Harris Oil Co.
163 Standard Roller Bearing Co.
164 The Firestone Tire & Rubber Co.
165 Oliver Mfg. Co.
166 The Timken Roller Bearing Co.
167 The Timken-Detroit Axle Co.
168 Pittsfield Spark Coil Co.
169 Spicer Mfg. Co.
170 Brown-Lipe Gear Co.
171 Swinehart Tire & Rub. Co.
172 Warner Instrument Co.
173 J. H. Williams & Co.
174 Kokomo Electric Co.
175 Warner Gear Co.
176 The Standard Welding Co.
177 The American Ball-Bearing Co.
178 The Fisk Rubber Co.
179 A. R. Mosier & Co.
180 Gabriel Horn Mfg. Co.
181 Castle Lamp Co.
182 Joseph Dixon Crucible Co.
183 Valentine & Company.
184 Heinze Electric Co.
185 Vacuum Oil Company.
186 Briscoe Mfg. Co.
187 The Wm. Cramp & Sons Ship & Engine Bldg. Co.
189 R. E. Dietz Company.
190 Herz & Co.
191 S. F. Bowser & Co., Inc.

BALCONY

223 Columbia Lubricants Co. of N. Y.
224 Bosch Magneto Company.
225 Michelin Tire Company.
226 Lovell-McConnell Mfg. Co.
227 The Elec. Storage Bat. Co.
228 Continental Caoutchouc Co.
229 Eisemann Magneto Co.
230 Stewart & Clark Mfg. Co.
231 Empire Tire Co.
232 Thermoid Rubber Co.
233 Vesta Accumulator Co.
234 New Departure Mfg. Co.
235 Link Belt Company.
236 The Hoffecker Company.
237 Lebanon Steel Casting Co.
239 Apple Electric Co.
240 The Turner Brass Works.
241 Auto Improvement Co.
242 American Ever Ready Co.
243 Stromberg Motor Devices Co.
244 Muncie Gear Works.
245 Gemmer Mfg. Co.
246 Excelsior Motor & Mfg. Co.
247 Warner Mfg. Co.
248 The Motz Clincher Tire & Rubber Co.
249 Miller Rubber Co.
250 Livingston Radiator & Mfg. Co.
251 The Star Rubber Co.
252 The Royal Equipment Co.
253 Driggs-Seabury Ordnance Corp.
254 The Cleveland Speed Indicator Co.
255 H. W. Johns-Manville Co.
256 The Stein Double Cushion Tire Co.
257 Edison Storage Battery Co.
259 Booth Demountable Rim Co.
260 George A. Haws.
261 The Homo Co. of America.
262 E. B. Van Wagner Mfg. Co.
283 Parker Motor Co.
284 Ross Gear & Tool Co.
285 Crucible Steel Co. of America.
286 Standard Thermometer Co.
287 Isaac G. Johnson & Co.
289 Whitlock Coil Pipe Co.
291 Briggs Mfg. Co.
292 Stevens Mfg. Co.
293 Orlando W. Young.
295 Newark Rivet Works.
700 Bicycling World & Motorcycle Review.
701 F. A. Baker & Co.
702 The Hendee Mfg. Co.
703 Reliance Motorcycle Co.
704 Pontiac Motorcycle Co.
705 N. S. U. Motor Company.
706 The Miami Cycle & Mfg. Co.
707 Harley-Davidson Motor Co.
708 Reading Standard Co.
709 Excelsior Supply Co.
710 Aurora Automatic Machinery Co.
711 Emblem Mfg. Co.
712 Pierce Cycle Co.
713 Consolidated Mfg. Co.
714 Merkel-Light Motor Co.
715 American Motor Company.
716 Marvel Motorcycle Co.
717 Motorcycle Pub. Co.
718 Motorcycling.
719 Eclipse Machine Co.
720 S. D. Manufacturing Co.
721 Motor Car Equipment Co.
722 Wagner Motorcycle Co.
723 H. & F. Mesinger Mfg. Co.
724 The New Era Auto-Cycle Co.
725 Detroit Motorcycle Mfg. Co.
726 Nathan Novelty Mfg. Co.
737 Syracuse & Elbridge Glove Co.

CONCERT HALL

302 Hayes Manufacturing Co.
303 Havoline Oil Co.
304 The Hess-Bright Mfg. Co.
306 Peter A. Frasse & Co.
308 Sparks-Withington Co.
309 Frost Gear & Tool Machine Co.
310 Willard Storage Battery Co.
312 Vanadium Metals Co.
314 Western Tool & Forge Co.
318 The Cuprox Co.
319 Atlantic Refining Co.
320 United Steel Co.
321 Vanadium Sales Co.
322 The Century Rub. Trad. Co.
323 Howard Demountable Rim Co.

2ND TIER AND ROOM 7

401 The Wright Wrench & Forging Co.
407 L. V. Fletcher & Co.
412 Philadelphia Steel & Forge Co.
415 International Metal Pol. Co.
415b Calmon Asbestos & Rubber Works.
419 E. M. Benford.
420 C. A. Willey Co.
423 Automobile Tire Co.
426 Reinhold Noflux Aluminum Solder Co.

BASEMENT

500 New York Sporting Goods Co.
501 Merchant & Evans Co.
502 Newmastic Tire Co.
503 Keystone Steel Casting Co.
504 Class Journal Co. (Automobile).
505 Class Journal Co. (Motor Age).
506 The Electric Speedometer & Dynamometer Mfg. Co.
507 Hydraulic Oil Storage Co.
508 Novelty Mfg. Co.
509 Kilgore Mfg. Co.
510 Garage Equipment Mfg. Co.
511 Dorian Remountable Rim Co.
512 The R. M. Hollingshead Co.
518 North East Electric Co.
526 Fegley Tire Chain Co.
536 Fay Machine Tool Co.
539 Fedders Mfg. Works.
540 Randerson Auto Parts Co.
541 The Perfection Spring Co.
543 Star Starter Company.
543a The Lefever Arm Co.
544 Wayne Oil Tank & Pump Co.
545 Joseph Tracy.
546 Ernest Flentje.
547 N. B. Arnold.
548 The Troy Carriage Sun Shade Co.
549 Ajax Trunk & Sample Case Co.
550 Post & Lester Co.
551 Motor Print Co.
552 Motor Vehicle Publishing Co.
553 Gotham Aluminum Solder Co.
553a Luce Mfg. Co.
554 John T. Stanley.
555 Motor.
556 Julius King Optical Co.
557 Jas. L. Gibney & Bro.
558 The Horseless Age.
559 Fred Robinson.
560 The H. S. M. Auto Switch Co.
561 The Power Wagon. Pub. Co.
564 Scranton Auto Equip. Co.
565 Wm. P. Miller's Sons.
566 P. Rielly & Son.
567 Atlas Chain Co.
568 Hilliard Clutch & Machinery Co.
570 The Walter H. Foster Co.
571 Findeisen & Kropf Mfg. Co.
583 Mutual Auto Accessories Co.
584 Barthel, Daly & Miller.
585 S. Hoffnung & Co., Ltd.
586 J. S. Bretz Co.
587 The Simms Magneto Co.
588 Automatic Appliance Co.
589 Nonpareil Horn Mfg. Co.
590 The Lutz-Lockwood Mfg. Co.
591 U. S. McAdamite Metal Co.
592 Gus Balzer.
593 New England Automobile Journal.
595 Harry A. Allers & Co.
596 Automobile Topics.
597 The A-Z Company.
598 Simonds Mfg. Co.
599 Thos. Prosser & Son.
600 Chilton Co.
601 International Enginering Co.
602 Chas. D. Tingley & Co.
603 Frank H. Cross Distributing Co.
604 Chas. J. Dowing.
605 The Eagle Co.
606 A. J. Myers, Inc.
607 The Harrison Radiator Co.
608 Tuttle Motor Co.
609 Westen Mfg. Co.
610 Clayton Air Compressor Works.
612 Keystone Lubricating Co.
617 Sheldon Axle Co.
618 Automobile Supply Mfg. Co
619 Star Speedometer Co.
620 Valve Seating Tool Co.
622 Alfred C. Stewart Machine Works.

Palace Show Cars Now Arriving

There is a gathering of the automobile clans apparent everywhere in metropolitan motor circles, and along with the men who make and represent cars, the cars themselves are coming, too. Every section of the land is contributing by fast freight and express. On account of the fact that the Palace Show comes first on the list of events, the cars that are arriving first are mostly destined for exhibit in that show, which opens New Year's eve and continues in session until January 7.

The aeronautic section of the Palace Show has attracted much attention and the announcement has been made that the Army and Navy Club, the membership of which is 2300, will attend the opening session in large numbers. Weight carrying biplanes and multiplanes will be featured and military and naval officers have signified much interest in them as well as the swifter types, for which a speed of as much as 85 miles an hour has been claimed.

The details of installation of wireless telegraphy in the flyers will be shown in practical form and two machines will receive and transmit messages under conditions that approximate those of service as nearly as possible.

The truck displays will be specially emphasized, the line entered for the show including an interesting lot ranging all the way from the giant $6,000 car that carries ten tons, to the small parcel carriers that negotiate a couple of hundred pounds and cost only a small sum.

The scarcity and high price of horse feed and the inability of Dobbin to compete with the motor truck in good or bad weather or roads, has centered attention on this form of transportation and the management is confident that the truck section will prove popular.

Importers Allot Show Space

Space allotments for the Importers' Salon, which will be held at the Hotel Astor, January 2-7, have been made as follows:

In the section on the left side of the main aisle the C. G. V. Import Company drew the space nearest the door, where C. G. V. and Zedel cars will be shown. The Panhard & Levassor Automobile Company will display Panhard cars in the next space, and the De Dion-Bouton Selling Branch will have De Dion cars in the third space. The Renault Frères Selling Branch drew the first space in the section on the right side of the main aisle, where Renault cars will be shown. A. T. Demarest & Co. will have the next space to display Itala and English Daimler cars. The Benz Auto Import Company of America will show Benz cars in the third space.

Cesare Conti will have the first space under the balcony, at the right of the entrance, to show S. P. A. cars. Henry Ducasse & Co. drew the next space for the display of Darracq cars. The Peugeot Import Company will have the next space for Peugeot cars. Of the spaces at the left side of the room, Burr & Co. drew the one nearest the Broadway side of the room, where they will show examples of fine coachwork. Next to them the S. P. O. Automobile Company will have the S. P. O. and Vinot cars. J. M. Quinby & Co. drew the third space for showing Isotta-Fraschini cars. Glentworth & Jackson will show Napier cars in the end space.

One Hundred Models at Milwaukee Show

MILWAUKEE, Dec. 19—The first drawing for space at the third annual Milwaukee motor show, to be held this year by the Milwaukee Automobile Dealers' Association, with the co-operation of the Milwaukee Automobile Club, indicates that the show will be far greater in scope and size than any previous exposition.

The drawing was held at the Auditorium on December 15, and representatives of nearly 100 cars, twelve commercial cars and a large number of accessory dealers were allotted space, demanding most of the 95,000 square feet offered by the main hall and corridors, as well as the smaller halls.

The commercial car exhibits will be confined to the basement directly under Main Hall. It is planned to provide 15,000 additional feet of space for accessories by erecting a temporary gallery over the permanent parquet seat section surrounding the arena of Main Hall. This gallery will be 24 feet wide and 600 feet long. The space assignments are as follows:

PLEASURE VEHICLES: Section A—Edward F. Leverenz, spaces No. 22 and 23; American Automobile Company, No. 12 and 13; Buick Motor Car Company, No. 21 and 20; Kopmeier Motor Car Company, No. 29 and 30; Schreiber Motor Car Company, No. 14 and 15; Franklin Automobile Company, No. 24 and 25; Johnson-Burnham Sales Company, No. 31 and 32; Mitchell Automobile Company, No. 27 and 28; Hickman-Lauson-Diener Company, No. 5 and 6; Bates-Odenbrett Auto Company, No. 18 and 19; McDuffee Automobile Company, No. 16 and 17; Albert Smith, No. 33 and 34; Welch Brothers' Motor Car Company, No. 1 and 2; Studebaker Automobile Company, No. 3 and 4; Emil Estberg, No. 7 and 8; Edgar F. Sanger Company, No. 10 and 11; Johnson Service Company, No. 9; Orrin B. Hughes, Marshfield, Wis., No. 26.

Section C—Warren Motor Car Company, spaces No. 1 and 2; F. A. L. Motor Company, Chicago, Ill., No. 7; Winton Motor Car Company, No. 6; Hearne Motor Company, No. 3; Gove Auto Company, No. 5; Akin Motor Car Company, No. 9; J. I. Case T. M. Company, Madison, Wis., No. 4.

Section D—Curtis Automobile Company, spaces No. 3 and 4; Velie Motor Car Company, Chicago, Ill., No. 1 and 2.

Lobby—West Side Auto Garage, No. 1; Mau Automobile Company, No. 2.

COMMERCIAL VEHICLES: Section 1—Buick Motor Company, spaces No. 3 and 4; Motor Truck Sales Company, No. 5 and 6; Johnson Service Company, No. 16 and 17; Brodesser Motor Truck Company, No. 18; Emil Estberg, No. 2; KisselKar Company, No. 19; Abresch-Cramer Auto Truck Company, No. 7; Orrin B. Hughes, Marshfield, Wis., No. 22; Stephenson Motor Car Company, South Milwaukee, No. 20; Commercial Auto Company, No. 1; Crown Commercial Car Company, North Milwaukee, No. 21; Welch Brothers' Motor Car Company, No. 9; C. F. Megow Company.

ACCESSORIES: Section F—Leo Hofmeister Company, space No. 1; Milwaukee Bronze Casting Company, No. 5; Milwaukee Oil and Tank Company, No. 2; Western Fixture Company, No. 6; Bartles-McGuire Oil Company, No. 4; Wadhams Oil Company, No. 7; Kamblee Company, No. 3.

Section, G—S. F. Bowser & Co., Inc., spaces Nos. 5, 6 and 7; Goodyear Rubber Company, Nos. 1 and 2; Standard Oil Company, Nos. 3 and 4.

Section H—Gross Hardware Company, Nos. 7 and 8; Wallmann Manufacturing Company, Nos. 9 and 10; Auto Supply Company, Nos. 5 and 6; Julius Andrae & Sons Company, Nos. 12 and 13; King Leather Tire Company, Nos. 15 and 16; Milwaukee Auto Specialty Company, No. 11; O'Neil Oil and Paint Company, No. 4; Milwaukee Tire Repair Company, No. 14; Avery Portable Lighting Company, No. 3; Sidney-Hirsch Company, No. 2; Garage Equipmnet Company, No. 18; Racine Auto Tire Company, No. 1.

AUTO TOPS AND BODIES: Rehearsal Hall—Milwaukee Trimming Company, Cream City Trimming Company, A. J. Monday, Charles Abresch Company, Longden-Buyger & Co., Fond du Lac, Wis.

Spaces Allotted at Hartford

HARTFORD, Dec. 19—Spaces on the main floor of Foot Guard Armory for the forthcoming show of the Hartford Automobile Dealers' Association, which is to be held in February, date as yet undecided, were allotted at a meeting of the association held this week. There are ten spaces on the main floor and an elevated stage, which this season, as in past years, goes to the Ford. Spaces 1 and 2, allotted to Brown, Thomson & Co., will be devoted to the display of the Lozier, Cadillac and Stevens Duryea. Space 3 was drawn by the Capitol City Auto Company, agents for the Mitchell, and Space 4 went to S. A. Miner, distributer of the Pierce Arrow. Space 5, the last on the north side of the building, was allotted to the Reo Automobile Company. On the south side of the building, Spaces 6 and 7 were given to the Palace Automobile Station Company, which will show the Thomas Flyer, Waverley electric, E. M. F. and Flanders. R. D. & C. O. Britton have the next two adjoining spaces and will show the Columbia and Maxwell lines, while the last space on the south side of the main hall goes to S. A. Foster & Co., agents for the Rambler and Regal. Other spaces in the basement, galleries and two front rooms off the main floor have not as yet been given out. The show committee is authority for the statement that there are enough applications on hand to fill two large buildings. An overflow hall is under consideration.

Colonels' Show in Big Armory

LOUISVILLE, Dec. 19.—The Fourth Annual Exhibition of the Louisville Automobile Dealers' Association will be held in the First Regiment Armory, which covers more floor space than any other building south of the Ohio River, March 15, 16, 17 and 18. The exhibit will open the evening of March 15.

Several committees have been appointed to make preparation for the show, the most important one being the publicity committee, composed of Hubert Levy, of the Hubert Levy Auto Company, and W. F. Glenn, of the Olds Motor Works.

The dealers have decided to spend considerable more money this year on decorations and expect to do something elaborate in this line. There will be a special department for commercial cars, electrics, accessories and the various trade journals.

Two-Bit Rate Killed at Chicago

CHICAGO, Dec. 19—S. A. Miles on behalf of the National Association of Automobile Manufacturers has made announcement that no 25-cent admission to the coming Chicago show would be in force. In place of such tickets, the exhibitors will be furnished with as many invitations as are needed, for which a rate of 50 cents each must be paid by the exhibitor. After the show the invitations taken up at the gate will be charged against the concerns issuing them, and the balance, if there be any, will be returned.

Among the other rules announced is one prohibiting the showing of commercial cars in the pleasure car section up to February 4. No exhibitor may remove his display from its sectional location until after 10.40 o'clock on closing night. This rule was enacted because of the tendency on the part of exhibitors at former shows to start their cars for the aisles early in the evening of the final night, thus hindering free passage and endangering spectators.

Detroit Space at Premium

DETROIT, Dec. 19—How to apportion 30,000 square feet of floor space among exhibitors sufficient to fill three times that amount was the problem confronting Detroit Auto Dealers' Association officials when it came to allotting space for the annual show to be held in Wayne Gardens, January 16-21.

Manager W. R. Wilmot conducted the drawing for places, the 24 association members having first pick, after which others who desired to be represented were cared for so far as possible.

The complete list of exhibitors is: Buick Motor Co., Brush Detroit Motor Co., J. H. Brady Auto Co., Cadillac Motor Car Co., Cartercar Co., Cunningham Auto Co., Elmore Automobile Co., Ford Motor Co., Grant Bros. Auto. Co., Lozier Motor Car Co., Wm. F. V. Neumann Co., Olds Motor Car Co., Seidler-Miner Auto Co., Standard Auto Co., J. P. Schneider Co., United Motor Detroit Co., Winton Motor Car Co., Security Auto Co., Rapid Motor Vehicle Co., Gillespie Auto Sales Co., Warren Motor Car Co., C. F. Gilmour, Alpena Motor Car Co., Hupp-Yeats Detroit Co., Krit Motor Sales Co., Anderson Carriage Co., Federal Motor Truck Co., Detroit Hupmobile Co., Collins & Co., Charles Berdan, Overland Motor Sales Co., VanDyke Motor Car Co., Phipps-Grinnell Co., Lion Motor Sales Co., Imperial Auto Co., R. H. Evans Motor Car & Parts Manufacturing Co., Amnett Auto Garage Co., Nederlander Auto Sales Co. This gives a total of 40 exhibitors, several of whom will have two or more makes of cars in the gardens, making the show stronger numerically than ever before.

Baltimoreans Confer on Show

BALTIMORE, MD., Dec. 19—Joel G. Nassauer, Thomas S. Young, Joseph M. Zamoiski, H. M. Luzius and Dr. H. M. Rowe have been appointed by the Automobile Club of Maryland the committee to arrange for the annual automobile show to be given at the Fifth Regiment Armory from February 21 to 25, inclusive.

This committee will meet Messrs. Zell, Schaab, Callahan, Duck and one other to be appointed, of the Baltimore Dealers' Association, in an effort to enter into a mutual agreement in handling the show. At this meeting it will be decided whether the club will hold the show as formerly or whether it will be a co-operative affair.

Buffalo Show Promising Affair

BUFFALO, N. Y., Dec. 19—Preparations are in full blast for the ninth annual Buffalo Automobile Show, which is to be held at the Broadway Arsenal during the week of February 6-12, by the Automobile Trade Association of Buffalo.

Although the hall is a capacious one, it appears from the present number of inquiries for exhibitors' space that it is going to be a difficult matter to take care of every one desiring to be represented.

Details Complete at Omaha

OMAHA, Dec. 19—The directors of the Omaha Automobile Show Association met last week and prepared a plat of the auditorium for the automobile show which opens Feb. 20.

Later all of the members of the association met and drew for spaces. There was a general protest for more space, so that it was decided to exhibit all of the trucks down in the basement. This will leave the whole floor of the large auditorium for the exhibition of pleasure vehicles. It was hoped to arrange it so that all of the cars should be exhibited on this floor, but there were too many pleasure cars to be shown.

The Johnson-Danforth Company, now dealing in the Avery truck, applied for membership and the privilege of exhibiting, and was admitted.

This makes a total of twenty-nine automobile dealers and five general accessories dealers who will exhibit. In addition, a dozen more dealers in tops, tires and other accessories have applied for space, and if possible will be accommodated.

Washington Dealers Draw

WASHINGTON, D. C., Dec. 19—With every inch of space allotted, the National Automobile Show, to be held in Convention Hall during the week of February 13, promises to be particularly successful.

The drawing for space took place last week and was attended by every dealer in the city. The hall will be divided into fifty-six spaces, which will be occupied by thirty dealers, representing fifty-four different makes of cars, and seven supply and accessory dealers. The show committee, of which W. C. Long is chairman, has the plans for the show well in hand.

Floor Space Taken at St. Louis

ST. LOUIS, MO., Dec. 19—The St. Louis Show committee reports that there is no more space to be had until the platting of the elevated aisle is completed. This will give 8,000 additional feet of space, and many applications have been received for reservations there, according to the committee. Rigid rules for conducting the exhibit have been adopted, and it also has been decided to advertise the show on an extensive scale within a radius of several hundred miles of St. Louis.

Pittsburgh Show in Exposition

PITTSBURGH, Dec. 19—Exposition Hall has been secured by the Pittsburgh Automobile Show Association for its display, March 18-25. The building is said to be the largest permanent exhibition building west of New York. So far space has been assigned to forty-two exhibitors. Among the recent accessions to the association are the Velie, Alco, Packers Truck, Penn Motor and Pittsburgh Motor companies. Thomas I. Cochran is manager.

Ford and Rambler at Brooklyn

While neither the Ford nor the Rambler will be exibited at either of the New York automobile shows, both will be exhibited at the forthcoming Brooklyn show. Already definite preparations are being made to accommodate at least 150 displays. Members of the Brooklyn Motor Vehicle Dealers' Association are enthusiastic about the prospects for a successful result of the enterprise.

Will Make Valveless Engine

DETROIT, Dec. 19—The Evans Motor Car & Parts Co. is preparing to put on the market a car incorporating the two-cycle motor controlled by the English Valveless Engine Co. A large plant is all ready to be put into commission as soon as the final details have been arranged, and the manufacture of cars and motors will shortly be undertaken on an extensive scale.

N. J. A. and M. C. Trustees Quit A. A. A.

WAVING a stuffed club over the heads of the victorious forces of motordom in New Jersey, the specter of dissension threatens to nullify the effects of the winning fight made by Jersey automobilists at the late election, when, on the face of the returns, the noxious State law which forbids anyone who lives outside the classic precincts of Jersey from tooling his car within the aforesaid classic precincts unless the regular Jersey license fee had been paid as a condition precedent, was defeated.

The appearance of the specter was not exactly unheralded, for a whole series of mutterings had been audible ever since the club members of Jersey decided last Spring to upset the law.

The form it took was the adoption of a set of resolutions by the New Jersey Automobile and Motor Club trustees to withdraw from the Associated Clubs of New Jersey, and that also means that the second largest automobile club in the United States has withdrawn from the A. A. A.

As nearly as it may be outlined at this time the case is about as follows:

Away back last April, before the primary elections, the clubs decided that Jersey ought to have at least an amendment to the law covering the visits of non-residents en motor. Instead of jailing a few millionaires who had the money and were willing to spend it in Jersey, it was thought advisable to welcome them and their money. The hotel men were particularly enthusiastic about this phase of the matter.

Therefore, the clubs got together and held meetings and appointed committees and adopted resolutions, and readily got down to hard, practical politics. So efficient did this work prove to be that several aspirants for legislative jobs were shelved at the primaries simply because they were non-committal on the subject of the amendment.

The New Jersey Automobile and Motor Club, a giant organization, bore a certain part in the activities of politics. If one credits what its officers and members say, it was the "big noise" of the movement. If one takes the views of the other fellows there might be a question as to its real service.

Nevertheless, when the votes had been counted the night of November 8 it was found that the candidates who had pledged themselves to knock out the old law by passing the important amendment stood out like an army, while the opposition was represented only by a sung little bunch of hold-overs.

Thus far it looked like a perfect "skeeze" for the automobilists. Then appeared the little crack within the lute. It seems that the Newark Club was not exactly in accord with the rest of the organization about the methods that should be used to introduce the bill. Some thought Senator Walter Edge should be father of the bill, while others believed the measure should originate from a Democratic member of the lower house. At any rate a double set of legislation was prepared, and now there is a man-sized fear prevalent that the forces arrayed against the automobile will take heart at the split and oppose the passage of a measure so important to motordom.

Colonels Wish to Secede from A. A. A.

LOUISVILLE, Dec. 19—Considerable of a sensation was sprung in local auto circles at a special meeting of the Louisville Automobile Club, when action was taken which was equal to withdrawal from the American Automobile Association. The local organization held a well-attended meeting at its club rooms in the Commercial Building, and after discussing the question at length the members unanimously decided to call on the directors of the club to request the Kentucky Automobile Association, the State organization, to withdraw its membership in the national body. Louisville controls the vote of the State organization, and it is practically certain that this will be done.

The action of the Louisville Club is explained by one of its officers, as follows: "We have been paying out good money, for which we have received no return. The State Association pays to the A. A. A. $1 a year for every member of the State-wide organization, and we have, therefore, been paying out a big part of our funds for the support of the three A's. This money has been used principally in connection with work in the East and, as far as we are concerned, has resulted in no benefit. We have, therefore, decided it would be best for us to get out."

It is believed by those in touch with the situation that the action of the local club will be followed by that of other automobile organizations in this part of the country, and that later on a compact club association will be organized to promote motoring in the Middle West and South.

A specific request for the financial statement of the A. A. A. for last year, on behalf of THE AUTOMOBILE, was denied by that organization on the ground that a rule had been adopted to first publish the statement in the "house periodical." In commenting on the above article, Chairman S. M. Butler, of the Contest Board, said that if the Kentucky A. A. wished to withdraw, it had that privilege. He said that he had received no information about such contemplated action.

Belated Action of A.A.A. Disqualification

Notwithstanding the fact that the automobile racing season is over until next Spring and that its action will have little actual effect upon the earnings of racing drivers banned by its rule, at least until they have had more than plenty of time to make defence and, perchance, succeed in having their disqualification raised, the Contest Board has taken definite action against certain erring drivers in unsanctioned meetings during the past season.

Those disqualified until January 1, 1912, are the following: Barney Oldfield and his four racing cars; Leslie Henry and the Pacific Coast Motor Racing Association; J. Alex. Sloane, manager of Oldfield; Ascot Park Race Track; J. R. Kittle; Louis Arms, Williams, a Los Angeles agent; Henry Koch; William Carlson; W. H. Faust, Henry Butley and Condit, another agent, all of whom took part in the recent Ascot Park meet.

Charles F. Stamps, L. H. Mellus and W. Gray, who acted as officials at the meet, received a similar sentence, while E. Roger Stearns and Ben Kirscher were suspended for a year, and George H. Clark for two years, the latter because of his driving under an alias.

The cars entered and used by the various banned drivers are specifically barred until 1912.

As an additional penalty on Oldfield, the board has notified the Automobile Club of America of its action, for transmission to the international body at Paris, from which it will be sent to the various national automobile clubs of the world.

The board also paid its respects to the unsanctioned meet held October 1-3 at Norfolk, Va. J. E. Sheldon, Louis S. Hallowell, Coburn Motor Car Company; George Edwards and Edward Allen, who took part in the meeting, were disqualified for one year.

The Maytag-Mason Motor Company, which was disqualified for participating in an unsanctioned meet at Boone, Iowa, was reinstated.

Legagneux Breaks Flight Record

PARIS, Dec. 21—M. Legagneux, holder of the world's altitude record in heavier-than-air machines, established a new mark in distance flights for the Michelin cup to-day when he flew 320.43 miles in one uninterrupted flight.

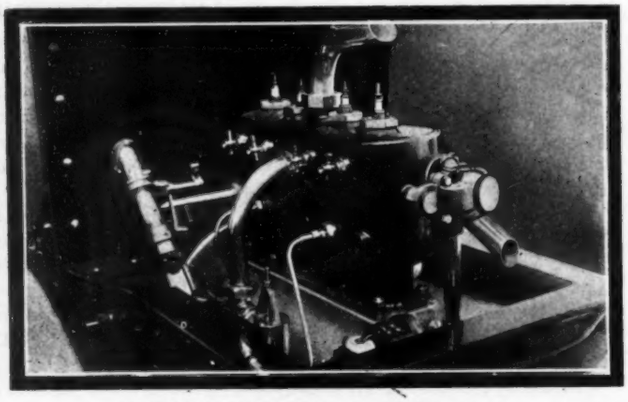
He started at 8:34 a. m. and finished his wonderful flight at 2:35 p. m.

French Refinements of Construction at Salon

PARIS, Dec. 13—Among the features of the Salon are the following:

On the Henriot system of rotary valve motor at the Paris Salon, a patent has been secured on the means for isolating the rotary valve from the combustion chamber at the moment of explosion. Near the head of the cylinder is a large port opening into a circular chamber within which is mounted a roller performing the functions of rotary valve. As can be seen from the illustration, there are two ports in this chamber, one opening into the induction pipe and the other communicating with the exhaust pipe. The rotary valve, which is hollow, has one portion of its face cut away to allow of communication between the combustion chamber and either the intake or the exhaust port.

The distinctive feature is that at the moment of explosion the piston has covered the port communicating with the rotary valve chamber, and only uncovers it after about one-sixth of the down stroke has been accomplished. The valve is thus isolated at the moment of greatest pressure, and it is this feature which, according to the inventor, has given success where other rotary valves have failed. The model shown is a four-cylinder motor in one casting, with the rotary valve carried in two ball bearings and driven off the mainshaft by means of bevel gearing and a vertical shaft.



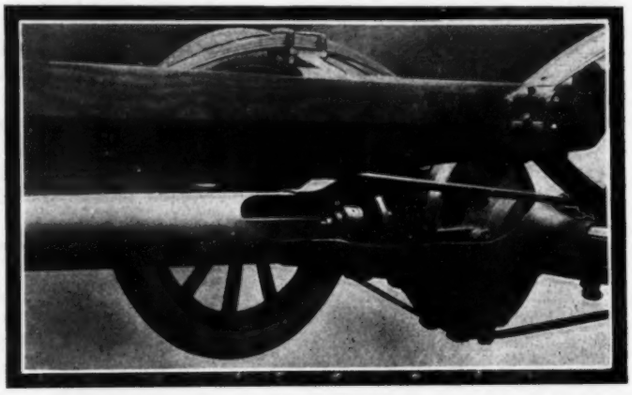
Henriot four-cylinder rotary-valve motor

It is claimed that by the use of a suitable type of cast-iron roller no leaks occur, and that the motor can be run satisfactorily as high as 4,000 revolutions a minute. The surface of the roller is lubricated under pressure by a lead from the crankcase base. One of these motors has been under test for a year on the road.

Berliet has produced a substitute for the poppet valve in the form of a piston valve motor, two pistons being employed for each cylinder, one for the intake and the other for the exhaust, and all connected to an auxiliary crankshaft driven off the mainshaft by spur gearing. The motor shown is a four-cylinder in one casting of 3.9 by 5.5 inches bore and stroke, with all working parts enclosed and the magneto carried across the front of the motor. This substitute for the poppet valve appears to be of such recent origin that the firm is not prepared to say whether it will be adopted in the future or not.

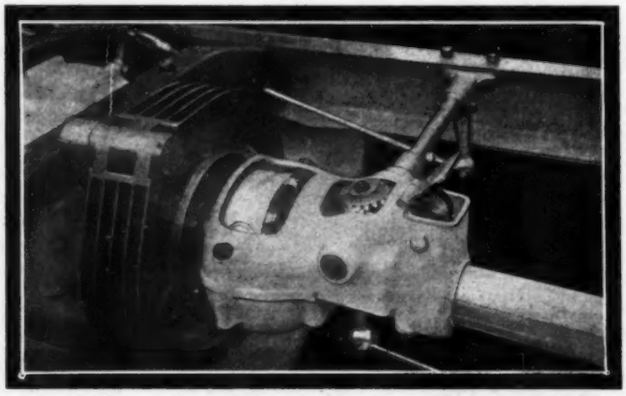
Ballot's attempt to provide a substitute for the poppet valve is in the form of a spherical sleeve in the head of the cylinder and having an oscillating motion by means of a suitably shaped cam on an overhead shaft operated from the mainshaft by a silent chain. As it oscillates the spherical sleeve successively uncovers the intake and exhaust ports carried in the head of the cylinder. The sleeve is kept in contact with the cylinder head by two coil springs.

Self-starters appear to have gone out of favor, for in no case were they to be seen on cars produced by big firms. A substitute for the starting crank was shown on the Mustad stand. The steering column had two wheels, the lower one being attached to an outer sleeve on the steering column and having at its base a bevel pinion engaging with a second pinion on the end of a horizontal shaft. The shaft passed through the dashboard, and at the opposite end, and under the footboards, was mounted a spur pinion. Keyed on the extremity of the motor shaft, just to the rear of the clutch, was another pinion, and between them an intermediate pinion normally kept out of engagement by means of a coil spring. A foot pedal allowed the intermediate pinion to be brought into engagement with the gear wheel on the driving shaft and on the motor shaft. Thus, by swinging round the lower of the two wheels on the steering column, the motor could be caused to turn. On releasing the pedal the intermediate pinion would slip out of engagement, thus releasing the wheel on the steering column.



Sizaire & Naudin rear axle, showing new torque tube. Direct drive on all three speeds

A neat and simple type of tire inflator was shown on both the Hispano-Suiza and the Piccard-Pictet cars, the two being built under the same license. On the gearbox cover was carried a small air-cooled cylinder, similar to a small motorcycle cylinder, with piston and connecting rod, this latter being connected up to a crankshaft having a squared end on which was mounted a spur pinion. By means of a cam and suitable lever projecting through the gearbox cover, the pinion could be moved on its shaft until it was brought into engagement with the first speed

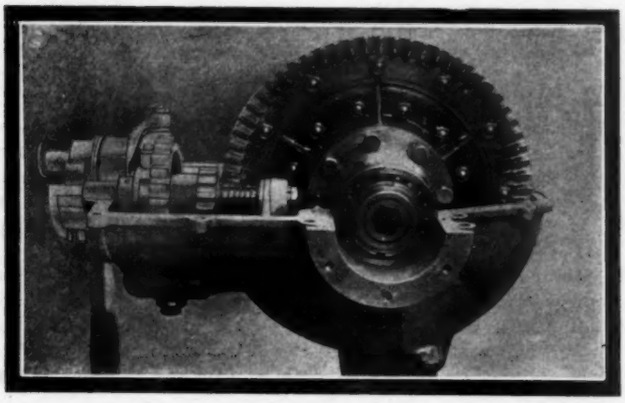


Renault brake on transmission encased universal joint; differential gear for rear brakes and oil filler shown open

pinion. The pump was sufficiently small and the gearbox carried sufficiently low for there to be no projection above the floor boards. The whole apparatus was most simple, and as the cylinder was only held in position by four bolts it could be readily dismounted.

How Michigan Law Works Out

LANSING, MICH., Dec. 19.—In an address before the American Road Builders' Association, which concluded a three-day session in Indianapolis recently, State Deputy Highway Commissioner



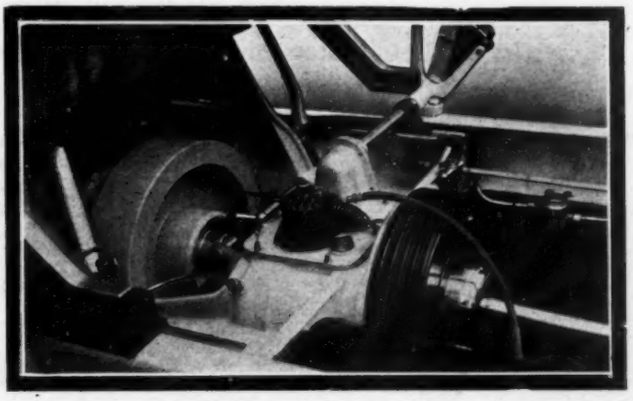
Miolans gear, giving 4 direct drives, right-hand side showing first and reverse speeds, shown at Paris Salon

Frank G. Rogers explained the highway system of Michigan, dwelling on the State Reward Law and the benefits that the State was deriving from the operation of the law.

Mr. Rogers stated that there were 70,000 miles of public highway in the State, and that 790 miles were either constructed or in course of construction under the provision of the law which provides a State reward of $250 to $1,000 per mile.

Maryland Law to Be Changed

BALTIMORE, MD., Dec. 19—Motor Vehicle Commissioner George wants an amendment made to the Maryland Automobile Law, whereby the registration year of licensed machines will



Tire pump on the Hispano-Suiza gear box. Behind the pump the external clutch spring will be noticed

begin May 1 and end April 30, instead of, as at present, from January 1 to December 31. He says that under the present arrangement the State loses thousands of dollars in revenue.

By taking out licenses as they do in April or May, they get part-year licenses, obtaining a reduction in fee for each month of the elapsed time between January 1 and the time the license is applied for.

Good Roads for Franklin County

MALONE, N. Y., Dec. 19—Franklin County is to have 152 miles of first-class highways inside of two years as the result of the recent adoption of a bond issue of $500,000 by unanimous vote of the supervisors.

It is planned to expend $3,000 a mile on construction work, and the first section to receive attention will be through the Adirondacks from Saranac Lake to Malone, passing through Paul Smith's, Meacham Lake and Cheem Falls. This will connect with the State road leading from Malone to the Canadian border.

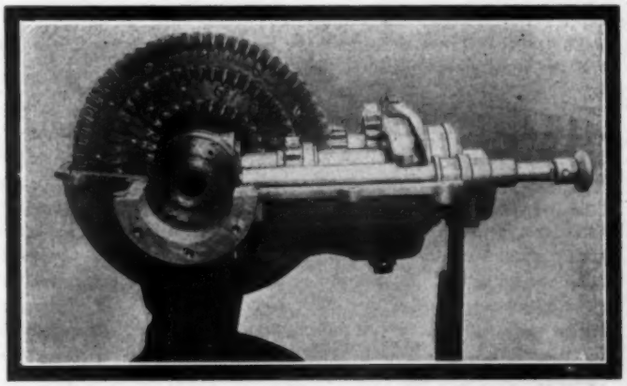
In connection with this project, the Canadian government has agreed to build a macadam boulevard from the international line into Montreal, following the St. Lawrence.

Work will commence in the Spring, and it is said that it will be completed, so far as the first section is concerned, in time for the 1911 touring season.

The project, which was suggested in practical shape by County Superintendent of Highways S. M. Howard, has received the support of farmers and merchants as well as hotel men.

Portola Race Again Postponed

SAN FRANCISCO, Dec. 19—Once again the Portola Road Race has been postponed. According to the latest plans the event is to be held over the San Leandro course on Washington's birthday, and is to be known as the Oakland-Panama Pacific Road Race.



Miolans gear with 4 direct drives, showing 2nd, 3rd and 4th speeds

The events are to be the same as scheduled for January 2. Manager Ferris announces that Los Angeles dealers will enter the following cars: Fiat, Isotta, Apperson, Simplex, Pope-Hartford, Only, Mercer, Maxwell and Staver-Chicago.

Ferris has the sanction and support of the Oakland and San Francisco dealers. He has been required to put up a $12,000 bond.

Insurance Companies Raise Ban

Insurance companies have withdrawn the restrictions whereby gasoline trucks were denied admittance to steamship piers in New York City.

Some time ago the insurance companies established a rule requiring occupants of piers, railroads and steamship companies to sign a warranty to the effect that such trucks could not be admitted upon their piers, and unless such warranty was signed an extra premium of 50 per cent would be charged. As a result of this dealers have found that a great many merchants have refused to supplant their horse-drawn delivery systems by motor trucks, owing to the necessity of whatever trucks they used frequently visiting the docks and piers to deliver or receive freight. The railroad and steamship lines have pointed to the attitude of the insurance companies as their reason for refusing admittance to the trucks.

News of Maker and Dealer in Many Fields

CLEVELAND, O., Dec. 19—A. C. Leonard, driver for W. T. Boutell, of Minneapolis, has been awarded $1,000 as first prize in the Winton Six upkeep contest for 1910. Between April 1 and November 30 Leonard drove Mr. Boutell's Winton Six a distance of 21,127 miles at a total repair expense of $1.40.

Second money, $500, was awarded to G. W. Butler, driver for J. E. Clenny, of Chicago. Butler drove 19,015 miles on a total repair expense of 30 cents.

Other prizes were awarded as follows

Third, $250, won by P. W. Mulford, driver for W. J. Friedlander, of Cincinnati; 18,809 miles; repair expense, 30 cents.

Fourth, $150, won by Wm. E. Ochsie, driver for Martin Daab, Hoboken, N. J.; 17,130.9 miles; repair expense, none.

Fifth, $100, won by John J. Boyce, driver for Isaac Bacharach, of Atlantic City; 17,390 miles, repair expense, $3.46.

Sixth, $100, won by Chas. A. Rice, chauffeur for L. T. Peterson, of Youngstown, O.; 15,790 miles; repair expense, none.

Seventh, $100, won by John T. Wilson, driver for W. B. Martin, of Cleveland; 14,847 miles; repair expense, none.

Eighth, $100, won by Michael Stone, driver for H. M. Cheney, of Toledo; 14,059 miles; repair expense, none.

Ninth, $100, won by Wm. G. Hyatt, driver for S. S. Boothe, of Los Angeles; 13,526 miles; repair expense, none.

Tenth, $100, won by Guy C. Davis, driver for Horace J. Phipps, of Boston; 14,208 miles; repair expense, $1.50.

The total distance driven by these ten men was 165,901.9 miles, and the total repair expense was $6.96.

G. J. G. Company to Build Runabout

WHITE PLAINS, N. Y., Dec. 19.—The G. J. G. Motor Car Company has made announcement that it would turn out a new type of runabout, beginning Feb. 15. The motor has four cylinders, 3 5-8 by 4 1-4 inches, cast of gray iron. The crank and cam shafts are drop forged, supported on Parsons' white metal bearings. The ignition system is by magneto, and the circulation is provided for with a centrifugal pump and Mercedes radiator. Cone clutch, splash lubrication, semi-floating rear axle and other standard features are included in its specifications.

Dealers Display New Cars

SPRINGFIELD, MASS., Dec. 19—The local dealers and representatives have now on display most of their 1911 models and automobile accessories in spacious and attractively decorated quarters, noteworthy among them being the Norcross-Cameron Company and William H. Dexter. The Norcross-Cameron Company have an up-to-date garage and salesrooms neatly decorated, along with an excellent display of 1911 models of the Peerless, Chalmers, Hudson, Buick and Waverly cars, for which they are the Springfield representatives.

William H. Dexter, in addition to a line of Cole cars, has added a display of the models of the Paige-Detroit cars, ranging in prices from $875 to $1,250.

Most of the automobile dealers and agents throughout the city report many new orders for 1911 cars, and it is the opinion that this will be the best season so far.

Maytag Company Reorganized

WATERLOO, IA., Dec. 19—The Maytag-Mason Motor Company recently has been reorganized, with capitalization of $1,000,000, and plans are being made to increase the yearly output from 1,000 cars to 2,500. The 1911 line includes seven models of pleasure cars on three different sizes of chassis, 26, 35 and 40 horsepower, respectively.

The company has made and marketed a two-cylinder motor, with which a favorable impression has been made in competition, both for speed and economy. The company plans to go into contest work on a larger scale next year.

In addition to the line of pleasure cars, the company manufactures a number of small trucks ranging in capacity from 900 to 1,800 pounds.

U. S. Motor Co. Annual Meeting

Reporting that business from August to November, 1910, exceeded that of the corresponding period of last year by 51 per cent., the United States Motor Company assembled in annual meeting Tuesday at Jersey City. The chief business on the calendar was the election of a board of directors and the entire incumbency was re-elected as follows: Benjamin Briscoe, J. C. Brady, J. D. Maxwell, C. G. Stoddard, K. B. Schley, Frank Briscoe, Horace de Lisser, J. H. Edwards, R. Irvin, H. Lloyd, O. J. Mulford, H. W. Nuckols, R. A. Robinson, J. W. Wellington and C. Tucker.

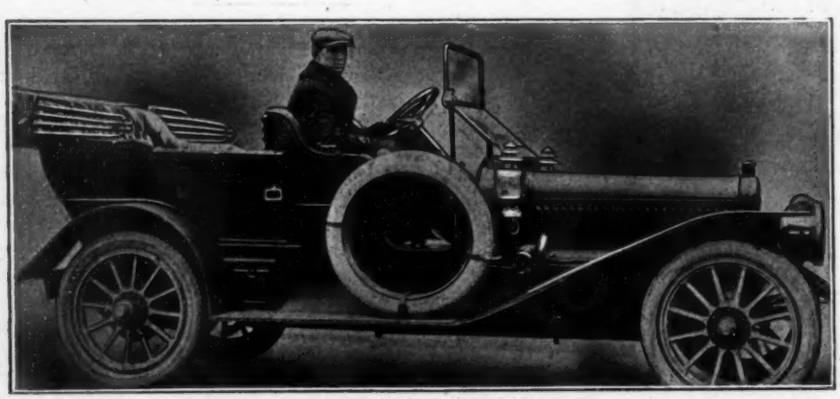
The directors are scheduled to meet again in the near future to elect officers.

Low Rates Please Moline Makers

MOLINE, ILL., Dec. 19—Announcement that the Trunk Line Association has granted reduced rates to the Madison Square Garden show in New York was hailed with delight by automobile manufacturers, dealers and owners in this vicinity. The Middle Western representatives promise to be present in force for the annual event. Local factories will be represented. C. H. Van Dervoort, sales manager, and Frank Salisbury will attend from the Moline Automobile Co. and will be in charge of an exhibit.

Workmen in the factory of the Mid land Motor Co. are busy preparing special exhibition chassis and motor for the Madison Square event. The Midland people are just getting out their 1911 models and, though late, these machines have more than the usual number of new features.

The Midland Motor Co. is planning to enter a 6-cylinder racer in the 500-mile race on the Indianapolis motor speedway May 27 of next year and expresses high hopes for the car.



Driver Leonard, winner of Winton upkeep prize

Peeps Through Auto Goggles at Distant Lands

MADRID, Spain, is waking. For the accommodation of automobile tourists a new hotel has just been opened. It is an up-to-date house, containing 185 fine bedrooms and 75 bathrooms. The proprietors aim to provide their guests "with all the comforts of home," together with a generous measure of cheer which will prompt the guests to declare that "they will always come back." In addition to being conducted on modern lines, this house, like some of the other modern hotels in Europe, has established a special passenger and luggage automobile service, five touring cars meeting all trains.

The splendid condition of the roads of Spain makes automobiling a source of delight in that country, and it is expected that as soon as the Winter wears away the custom of touring, as established by the jolly young King Alfonso, will be resumed with vigor and continue to grow in popularity as favorable conditions in the land of the Dons become known to automobilists, and especially to those from foreign nations who cross the border seeking new highways and byways to conquer.

In England a new spring-wheel for use on motor vehicles is about to be introduced. The periphery of the wheel is composed of eighteen links, each hinged to its neighbor on either side. The links in question consist of triangular blocks of wood, and while the bases make up the periphery, each apex is hinged to a piece of metal which is firmly attached to a volute spring, which is from four inches to five inches in length, according to the weight of the vehicle that has to be supported. The other ends of the volute springs, of which there are eighteen, disposed radially, are affixed to the hub, or rather to a small inner wheel of the ordinary artillery pattern, with 12 spokes. The springs are made of slightly tapered strips of special steel coiled spirally in such a way that the greater part of each turn is within the preceding one, and that under sufficient compression the whole of the inner coils can be forced within the outermost one. Blocks of hard fiber and gutta-percha are cemented to the surface of the links which roll on the ground.

The inventor intends the wheel for heavy commercial vehicles and motor omnibuses, the purpose being to give them the benefits of the pneumatic tire without using a particle of rubber in the construction of the wheel. The spring-wheel was put to the test in London the other day, a pleasure car equipped with the invention having been driven through the thick of traffic.

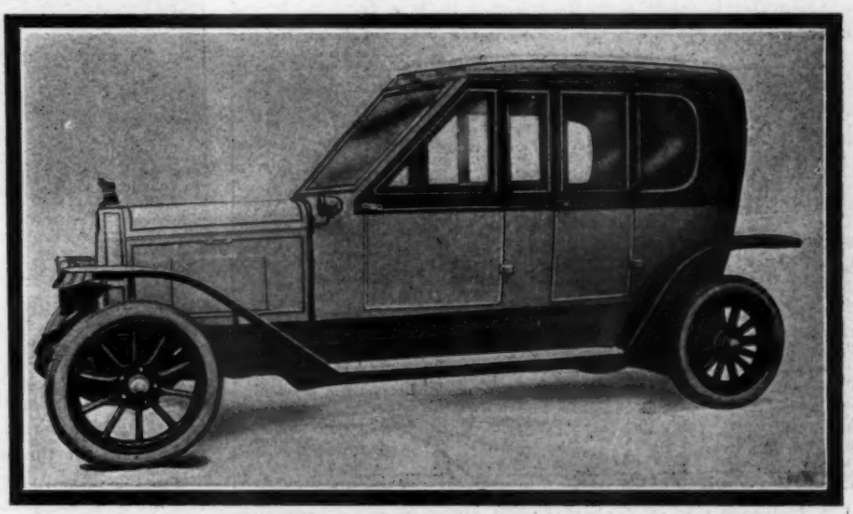
Two railless, overhead-trolley systems of tram cars have just been put into service in Bremen, Germany, connecting the outlying districts with the tram car lines running to the center of the city. The cars are of the ordinary automobile omnibus dimensions, but the electrical equipment being lighter, the weight of the cars is less than the conventional automobile omnibus. As it is necessary for the car while running to give way and move at times from 15 to 30 feet from one side of the street to the other, the difficulty was in constructing a trolley to this end. A Bremen engineer devised a way, and he has had his invention patented. The upper as well as the lower contact is increased by means of springs. Two wires reach into the car from rollers and hoops which are well insulated from each other. The car, while under way, passes other vehicles by reason of the extension of the wires, which uncoil from the drum inside of the car, and the drum automatically winds the wires up again at the least slackening. There are no switches attached to the wires; therefore, the trolleys of cars as they meet may simply be exchanged, allowing each car to renew its journey, the delay incidental to "waiting at the switch" being avoided. The wheels run on ball bearings and have solid rubber tires. The steering apparatus is similar to that used on pleasure automobiles.

Tsingtau, China, has about sixty miles of splendid roads running along the ocean front and into the mountains near by, affording one of the finest spots in the world for automobiling. In spite of this fact, there are but six automobiles in Tsingtau, and none of these is of American manufacture. Shanghai is the nearest convenient trading point from which machines might be shipped, and the freight charges, under the conditions, are not unreasonable.

Guadalajara, Mexico, harbors about 120 automobiles, of which 75 are in constant use, including one traffic car. The others are either in the hospital or their owners are not in the city. Cars thus out of commission cease paying the tax while idle, the amount of the levy being $4.98 per month. There are few asphalt-paved streets in the city, the country roads are bad, the hotels are not inviting and there is no local agent actively representing any manufacturer. Outside of the tax the cost of operating a car is not great. Good gasoline is 27 cents per gallon, and a chauffeur may be employed at $14.94 to $19.92 per month. A mechanic of good ability receives $62.50 per month. There are three garages in Guadalajara. About 60 of the machines are American-made, 30 are French, the remainder are English, Italian and German.

Chile holds out little encouragement for the introduction of the automobile for the reason that the number of desirable roads is limited. Valparaiso and the adjacent towns possess 30 cars of all sorts, and the chances for an increase in the number are not bright. Santiago has from 75 to 100 machines, with about the same country road conditions as are found in Valparaiso, although Santiago's streets are better paved. European-made machines are mainly seen in Chile, although the few American cars found here are splendidly adapted to the country owing to its hilly roads, and good climbers being necessary. There is no competition for this trade amongst automobile manufacturers.

New South Wales shows enterprise in the introduction of automobiles, the number being 1,095, exclusive of motor buggies and certain makes of which there are only one or two running. America is represented by 119; England, 519; miscellaneous foreign, 467. Altogether, 142 makes are found in the Commonwealth.



Inside drive body on a Pipe chassis, shown at Paris Salon

Cameron Sees Big Gun Cast by Krupp

TOLEDO, O., Dec. 19—W. H. Cameron, chief engineer of the Willys-Overland Company, has returned from his European trip with Mrs. Cameron, arriving in New York via the steamer "President Grant." During his visit in Germany he was granted the unusual privilege of inspecting the works of the great Krupp company. Mr. Cameron says that the German manufacturers are centering a vast amount of attention upon the chrome-nickel alloys and that they are not doing much with vanadium and other varieties of steel alloys for automobile work.

He says that his statements about the use of vanadium and its advantages proved surprising to the Teutons. He witnessed the casting of a huge gun at the Krupp plant. He states that the material from which the gun was made was treated in seventeen large furnaces, each containing 100 crucibles, and requiring the services of 500 men to cast.

French Factory for Goodrich

PARIS, Dec. 14—The Goodrich Tire Company has decided to manufacture in France. For this purpose the European company has just secured possession of a large factory at Colombes, near Paris, recently vacated by the now defunct Krieger Gasoline-Electric Company. With a total area of 30,000 square yards, the space available is sufficient for a very large production.

It is expected that the new factory will be in working condition early in the spring and will be controlled by engineers and foremen from the Akron establishment. When in full working order it will supply the whole of the European market, comprising France, Italy, England, Germany and other outlying countries.

Not only will freight charges be avoided, but the high duty at present paid to bring American tires into most European countries will be removed. The company has had a selling branch in London for several years, and about three years ago opened a selling branch in Paris, primarily for the convenience of American tourists who were unable to use French sizes on their American rims. Since then the business has grown to such an extent that the supplying of tourists is a mere side issue. In France the Goodrich company has had considerable success with the taxicab companies.

Plans of Parry Auto Co.

INDIANAPOLIS, Dec. 19—Creditors of the Parry Automobile Company have practically agreed to ask the Superior Court to authorize the operation of the plant by the Union Trust Company, receiver, and to authorize a limited issue of receiver's certificates for the purpose.

After this is done it is probable the receivers will organize a holding company to take over and operate the plant until the indebtedness has been removed. During the last week the creditors have held a number of meetings here.

Panhard Valveless Motor

SHOWING ABSENCE OF VALVE POCKETS, CLEANLINESS OF DESIGN AND ACCESSIBILITY OF ALL PARTS, ROCKING MAGNETO ADVANCE

ANOTHER prominent maker to adopt the Knight engine system is Panhard et Levassor and their product will be known as Valveless-Panhard. The general principle is identical to that used on the Knight-Daimler, but the engine differs in several details.

The intake side of the motor, which has a bore of 100 millimeters (3.93") and a stroke of 140 millimeters (5.51"), is particularly free and accessible. The pump P is of the centrifugal type and is driven by a cross shaft that also serves to drive the magneto. The shaft is actuated by worm-gear from the eccentric shaft, which in its turn is driven from the crankshaft by a silent chain through a sprocket attached thereto, the covering for which is marked T, Fig. 1.

The water is taken from the radiator through the pipe D and circulated by the pump P through D1 and returned to the radiator through D2. The intake manifold is made from copper with the lugs sweated on, carrying the carbureter so that it is easily removed. The float chamber is fitted with a removable

Fig. 1—Intake side of Panhard-Knight motor, showing carbureter water pump

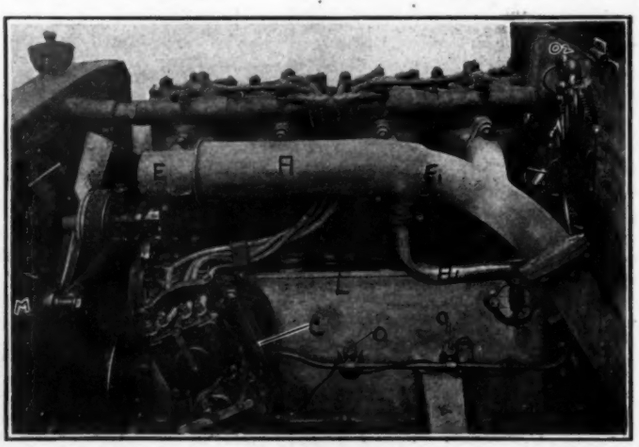


Fig. 2—Exhaust side of Panhard-Knight motor, showing rocking magneto retarded

cap F for flooding purposes and the usual Krebs air adjustment is located in B. Hot air is supplied to the carbureter through A2, while the sleeve A3 is fitted to give the requisite amount of cold air in hot weather. The control is by wires actuated from the center of the steering wheel passing over the roller H, which is fitted with a spring to carry the wire with it as it is played out and causes the throttle to rotate. The spark plugs are situated at S1, S2, S3, S4 directly over the center of the piston. A pump for the gasoline pressure is fitted and marked R and is driven by a small cam. In Fig. 1 the closeness of the joints at the

cylinder bases is clearly shown and one bolt L serves to hold a pair of cylinders to the crankcase.

The feet are particularly large and the water-cooling area has been carried very low, as, besides the pistons, the sleeves require cooling as well. The same cleanliness wil be noticed on the exhaust side, the method of driving the magneto being clearly seen. The magneto employed is the Nilmelior and instead of the usual advance in this case the whole magneto is rocked from side to side; in Fig. 2 it is toward the radiator and in Fig. 3 it is inclined to the dashboard. The control is by wire C and is held forward when the wire is slack by the spring S. The exhaust manifold E carries on it a sleeve A welded to it at E1 preventing the air that enters from escaping except through A1, which leads to the carbureter. V and V1 are air vents for the crank chamber, W4 is a plug to drain all the water from the cylinders; other drain plugs are situated beneath the pump marked W5, Fig. 1, as well as in front of the radiator. The neat water joints W, W1, W2, W3 conduct the water from cylinder to cylinder. The heads are cast separately from the bases of the cylinders and it is almost impossible to see the joint, but this is located at the line J on the front cylinder; they are held by six nuts.

Reference to Fig. 4 shows the eccentric shaft L and the connecting rods M and M1 which operate the sleeves N1 and N driven by

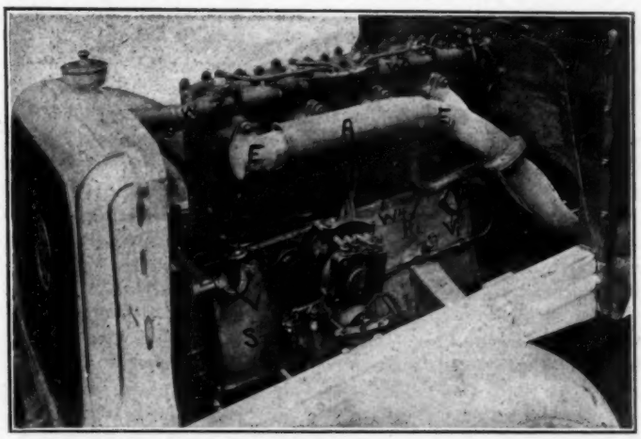


Fig. 3—Exhaust side of Panhard Knight motor, showing magneto advanced and hot air intake

the chain from sprocket J to sprocket K. The shape of the piston H and compression chamber leave no room for pocketing of the gases and the lubrication of the piston sleeves and cylinder walls is by splash, the oil passing through the cross-drilled holes in the different parts. The lubrication system for the rest of the motor is effected by the pump U in Fig. 5; oil is taken from a reservoir under the floor boards and passes through the lubricator glasses on the dashboard, thence to the pump, which sends it to the main crankshaft bearings, it eventually finding its way to the crankcase to act for the splash, no used oil passing back to the pump.

The ports n1 open at the proper time for the suction and the ports n2 open for the exhaust. The magneto and pump drive O is carried on ball bearings and is driven by a worm at 90 degrees.

"The American Invasion"

Take this matter of the alleged invasion of our market by American motor cars. I am not for the moment referring to those cars of American origin which have already been upon our market for some time, but to the newcomers, whose arrival in bulk is anticipated. Our attitude is splendidly indifferent. "Nothing doing," we say. "Do you remember what happened to the American bicycle?" we say. "History just repeating itself," we say. "American cars not suited to our conditions; will never find a market here," we say. And so on. Our

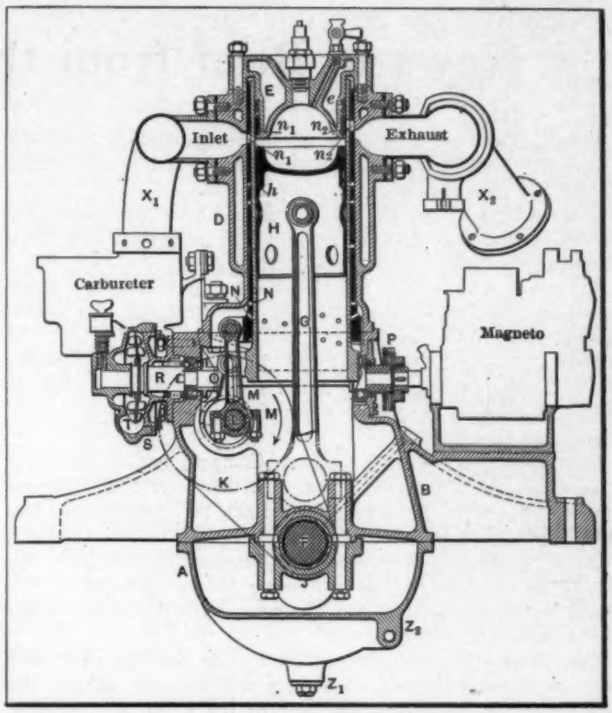


Fig. 4—Transverse section of the Panhard Knight motor, showing disposition of magneto and water pump and the chain-driven half-time shaft. It will be noticed that the actuating arm for the sleeves is in the shape of an ordinary connecting rod

trade is very nice and healthy just now, do you see. We are plump and warm, and our outlook is rose-colored. "Let us eat, drink and be merry to-day—why not?" we say.

Why not? The story of the prodigal son makes answer. The whole of our experience makes answer. If there were no to-morrow we might live out to-day to the uttermost. But as there *is* a to-morrow, it would not be bad policy to waste less in riotous living now. Do not let us make the gorgeous mistake of supposing that we have nothing to learn from America. Do not let us imagine for a moment that the American car cannot function as well (or better) on our roads as on the roads for which they were first of all made. And do not forever be dragging in the tale of the American bicycle. It has nothing to do with the case, except to indicate the only manner in which we may deal with the American car.—*Motor World*, London.

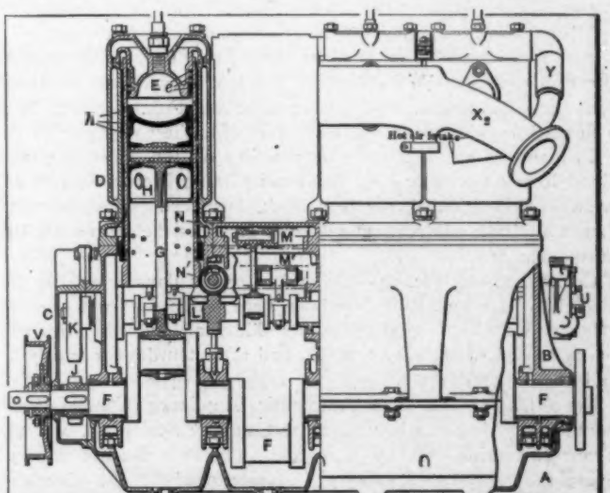


Fig. 5—Longitudinal section of the Panhard Knight motor, showing spherical pistons, crankshaft, and half-time shaft and the oil pump U

News in Brief from the East, West and South

BOSTON, Dec. 19—A meeting of the reorganization committee of the Bay State A. A. was held recently at which it was decided to have the annual meeting on December 28.

CLEVELAND, Dec. 19—William Orden has been appointed agent for Northern Ohio for the Auburn line of motor cars. His headquarters will be at the Lorain Clark garage.

TEXARKANA, TEX., Dec. 19—The Ohio car now making a transcontinental tour from New York to San Francisco has passed this point on its way westward.

NORWICH, CONN., Dec. 19—F. W. Browning, president of the Uncas Specialty Company has taken active charge of the affairs of the company. Robert R. Keith is general manager. B. F. Leavitt has resigned.

NEW YORK, Dec. 19—The Carhartt Company has increased the price of its 30-35 model to $2,500. At this price the equipment consists of windshield, remountable rims, top, speedometer and license plate holders.

DETROIT, Dec. 19.—The Ackerson Engineering Company has made announcement of its succession to the business of the Merle MacFarland Company. The company makes axles, power plants, motors, jack-shafts, etc.

NEW YORK, Dec. 19—Henry Knott, who for the past three years has been associated with the Frank Seaman Agency, has been appointed advertising manager of the E. M. F. Company, with his headquarters at Detroit.

DES MOINES, IA. 19—A room has been set aside at the Coliseum, at which the Second Annual Automobile Show will be held, for the exclusive use of the various trade papers during the show. The show dates are March 7 to 11.

CLEVELAND, Dec. 19—The factory of the Gabriel Horn Co., 1407 E. Fortieth street, was completely destroyed by fire Saturday, December 10. The loss is estimated at from $50,000 to $75,000 a great part of which was in valuable stock.

PITTSBURG, Dec. 19—From January 16 to 21 an auction sale of automobiles will be held in the Exposition Hall. The sale is announced to be open to anyone who wishes to buy or sell a car and is being fostered by leading members of the trade.

FT. WORTH, TEX., Dec. 19—The Southern Motor Works has opened a distributing branch at 707 Commerce street, this city, which has been placed in charge of H. H. Brooks. A complete stock of Marathon cars, as well as parts, will be carried.

NEW YORK, Dec. 19—Considerable talk has been indulged in about the building of a municipal garage to care for the 130 automobiles owned by the City of New York. The number of machines has been increased by 11 during the current year.

SAN FRANCISCO, CAL., Dec. 19—The San Francisco branch of the Firestone Tire & Rubber Co. has just moved into its handsome new building at Van Ness avenue and Fulton street. It is a three-story structure, built exclusively for the company.

PHILADELPHIA, Dec. 19—The meeting of the Executive and Good Roads Committee of the Pennsylvania Motor Federation, which was scheduled for last week, has been postponed until January. Lack of sufficient notice is given as the reason for the postponement.

COLUMBUS, O., Dec. 19.—On and after ten days it will be unlawful to have an automobile horn here which does not give off efficient warning signals. Mayor Marshall signed the ordinance passed recently by Council, and after ten days it will be in full force and effect.

BOSTON, Dec. 19—The Automatic Appliance Company announces that it has taken over the Couch & Seeley Co. and the Transfer Issuing Machine Company. The new concern is occupying the offices and factory formerly used by the Couch & Seeley Co., 162-172 Columbus avenue.

CINCINNATI, Dec. 19—The Schacht Motor Car Company is now comfortably installed in its new plant and is turning out four-cylinder cars at the rate of ten a day. The present factory is three times as lorge as the old plant, with acreage for increasing to four times its present capacity.

NEW YORK, Dec. 21—The regular monthly meeting of the Electric Vehicle Association of America was held last night at the Engineering Societies Building. "The Alkaline Battery," by W. H. Holland and "The Mercury Arc Rectifier for Charging Electric Vehicles," by R. E. Russell were the two set papers read.

NEW YORK, Dec. 19—A midnight class of the Automobile School conducted by the West Side Young Men's Christian Association, 318 West Fifty-seventh street, has been opened to meet the demand of night workers who, because of their hours of employment, are unable to attend the regular day and evening classes.

INDIANAPOLIS, Dec. 19.—Harry C. Stutz has joined the forces of the Empire Motor Car Company, of Indianapolis. Mr. Stutz has been associated with the Marion, American and Overland automobile companies, also with the Schebler carburetor concern as engineer, and is now head of the Stutz Auto Parts Company, of Indianapolis.

RACINE, Dec. 19.—C. O. Hamilton, of Sayrick, O., was elected president of the National Gas & Gasoline Engine Trades Association last week. The other officers elected are: Vice-president, A. C. Parker, Racine; secretary, Adolph Strictmatter, Cincinnati, O.; treasurer, O. M. Knobloch, South Bend, Ind. The semi-annual session will be held in Detroit next June.

BALTIMORE, MD., Dec. 19—Several changes have been made in connection with the local agency of the Ford Auto Company. Robert F. Kaehler, formerly of the Baltimore office, has gone to Richmond, Va., to take charge of that branch, while J. K. Harper, formerly of the Richmond, Va., branch, will be identified with the Baltimore branch after January 1. A. M. Eastwick will be in charge of the Baltimore branch.

MOLINE, ILL., Dec. 19—C. H. Van Dervoort, sales manager of the Moline Automobile Company, East Moline, Ill., and F. G. Salisbury are on a trip through the South, during which they will visit agents and establish several new agencies. Previous to the time of their departure a touring car, 1911 model, was shipped to Memphis, Tenn., and Van Dervoort and Salisbury will use the machine out of that city.

NEW YORK, Dec. 19—Automobile manufacturers and dealers of New York city and vicinity, are demanding of the Secretary of State, better facilities for obtaining license numbers for motor vehicles. They have been put to a great deal of inconvenience and trouble, on account of being compelled to loan purchasers license numbers, while the purchaser is awaiting the receipt of numbers for his machine, from Albany, which usually takes about ten days.

NEW ORLEANS, Dec. 19—Entry blanks are out for the New Orleans Mardi Gras Speed Carnival, the third running of which will take place February 25, 26 and 27, 1911. A big list of events has been arranged by Secretary-Manager Homer C. George, of the New Orleans Automobile Club, and every indication is said to point to a record-breaking number of cars. The prize list amounts to $3,500, with the various events ranging from five to fifty miles each, in addition to two one-hour races.

NEW YORK, Dec. 19—The Joscelyn Stable Co., 112-126 West Fifty-second street, has issued a booklet describing the immense garage conducted by the company. The building is four stories, 200 by 100 feet, and is reckoned to be as nearly fireproof as any in its line. The garage is equipped with cement floors, metal ceilings, steel lockers, three large elevators, telephone on each floor, compressed air service, buffing machines and vacuum cleaners. A full line of accessories is carried. Special regard for the comfort of chauffeurs has been provided.

Proper Garage Fittings

In the Handling of Gasoline and Lubricating Oil in the Average Garage the Entire Cost of a Decent Set of Fittings Is Dissipated at Least Once a Month

DISREGARD of considerations for economy in the maintenance of the garage have such far-fetched consequences in several directions that it may not be considered out of place if a few of the points are afforded discussion and suggestions of a remedial nature are offered. Before talking about the details and the methods by which economies may be perfected it will be to the purpose to point out that lubricating oil, even though it does cost far too much money to permit it to run on the floor, should be kept in the oil tank where it belongs on account of the savage manner in which it attacks the rubber of the tires, thus making heavy inroads upon the factors for general economy. In the same way, while it is true that gasoline is too high-priced to consider permitting it to run into the sewer pipe, it has that element of risk involving the fire hazard and possible explosions which is a sufficient reason for wishing to keep it in a storage tank rather than to permit it to escape onto the garage floor.

Fig. 2—Combination measure and funnel

Then there are the questions of labor cost. If a workman has to discover a pin-hole leak in an inner tube and he takes, say, three hours in the process, his time, at 60 cents per hour, may foot up to a sum total greater than the value of the inner tube. There are a considerable number of like problems scattered through the average large garage, and the Dover Stamping & Manufacturing Company, of Cambridge, Mass., has given all of these matters a considerable amount of attention, with the result that this study and investigation has brought out the various types of equipment which it recommends for use. Referring to Fig. 1 of the new Dover testing tank, it will be observed that the inner tube is permitted to rest in a suitably shaped pan, and by means of a rod with a gooseneck extremity the tube is held in its natural shape, thus permitting the workman to quickly determine whence the leaks come by observing the source of any trouble that might rise up in the water in the tank. The pan is made of heavy steel suitably galvanized, with a double seam construction, capable of being filled and emptied quickly, and occupying but little room on the shelf when it is not in actual service.

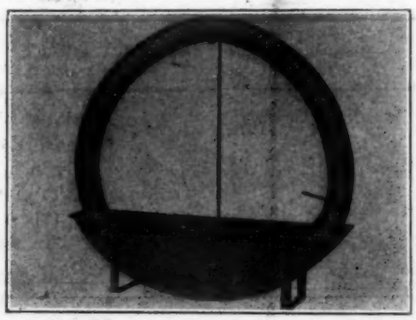


Fig. 1—New tank for testing tires, with support for the top

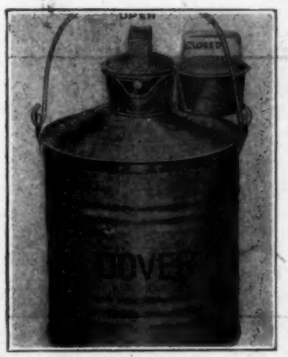


Fig. 4—Non-evaporating gasoline measure

In order to avoid the spilling of lubricating oil and gasoline, the company has brought out what is known as the "duplex" combination measure and funnel as shown in Fig. 2. The features of this combination measure are manifold; among them these four may be mentioned: No. 1 is the pouring lip, which is used when a funnel is not necessary and fast pouring becomes desirable. Feature No. 2 is the advantage of the funnel for pouring, thus making it possible to replenish an oil tank, even though it may have a small filler orifice, without losing a part of the oil. Feature No. 3 is the handle on the side, by means of which it is possible to use the measure with certainty and without the discommoding feature which would be represented were the handle in the wrong place where it would be likely to get in the way. Feature No. 4 has to do with the measuring marks, which are graded to half-pints, pints and quarts, which is a great convenience.

Referring to Fig. 3 of the Dover radiator filler, the funnel scheme is retained, but it is also fitted with a brass strainer so that foreign matter is excluded from the radiating system, and the work is done with greater efficiency; moreover, the spilling of water over the varnished surfaces of the car is avoided. Fig. 4 shows the new non-evaporating gasoline measure which is designed to hold five gallons of gasoline, it being 11¼ inches in diameter and 18 inches high over all, with a filling opening which is 4 inches in diameter. In this can the pouring lips and filler opening are combined. The filler opening has a cover plug which is so arranged that by turning it one-half around the pouring lip is shut off and the remaining gasoline is prevented from evaporating.

Fig. 3—Radiator filler, with funnel and brass strainer

Fig. 5—Rust-proof steel 5-gallon wagon measure

Fig. 5 shows the new five-gallon wagon measure, which is made of extra heavy steel and galvanized after it is made so that the seams and other crevices are rendered rustproof. The body and bottom of this measure are heavily reinforced and the bail is provided with a large boss so that the measure is easy to carry. This type of measure is used by dealers for the most part in connection with the gasoline delivery wagon. Fig. 6 presents a type of garage funnel with a capacity for six gallons. This funnel is provided with a chamois strainer and is intended for rapid work. It is made of heavy steel, and, like other Dover products, is galvanized after it is made. The chamois-skin is held by a large hook which has the effect of stretching it tight across the bottom for the full diameter of the funnel, and it is supported by a wire rack to prevent sagging.

Fig. 6—Garage funnel for rapid filling

Among the Accessory Makers

A NEW TYPE OF ROLLER BEARING; RHEOSTAT FOR CHARGING BATTERIES; WORK UNDER A CAR MADE EASY; HAZARD GEAR-SHIFTING LEVERS

GILLETTE TYPE OF ROLLER BEARING

The modern trend in roller bearing work is in the direction of the narrow type so that roller bearings will fit into substantially the same space as is nor-

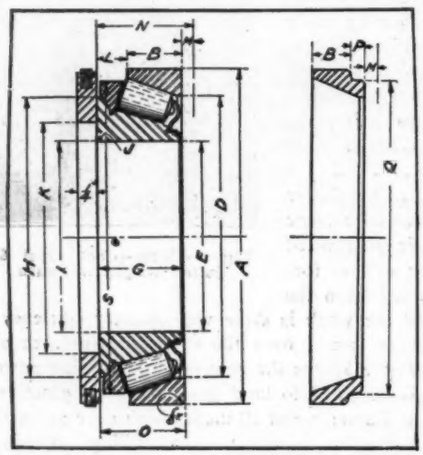


Fig. 1—Illustrating the Gillette type of roller bearing

mally required for annular types of ball bearings, and the Gillette roller bearing as shown in Fig. 1 is so designed that the distance N is about on a par with standardized space, which distance varies of course with the different sizes of bearings, and the sizes in turn are in keeping with the loads that the bearings will have to carry. The over-all diameter A is ground to a definite size, and the inside diameter E is very carefuly ground, thus making it possible to fit the bearing on a ground shaft, so that it will tap on and if suitably endwise clamped will serve without burrowing into the shaft. The rollers are tapered and traverse a pair of truncated cones, the outer one of which is shown separately, and the inner cone, or raceway, is presented in the assembly. The several other dimensions as indicated in the illustration by letters are given in a tabulation which the company sends out. The R. G. Peters Mfg. Co., Grand Rapids, Mich., are the makers.

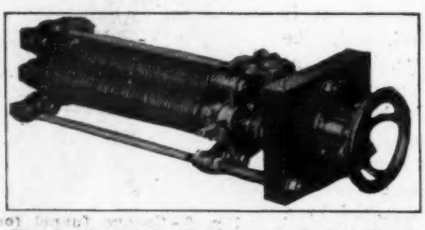


Fig. 2—One of the three types of Allen-Bradley battery-charging rheostats

BATTERY-CHARGING RHEOSTATS

Referring to Fig. 2 of the Allen-Bradley H2 panel type of rheostat as made by the American Electric Fuse Company of Muskegon, Mich., it will be observed that the resistance is varied to suit the charging conditions of the battery by turning on a hand-wheel at the right and the extent to which it is necessary to alter the resistance in circuit will be known to the operator since he will observe the ampere readings of the meter, varying the resistance to suit the charging rate of the particular battery that is undergoing treatment in any given case.

This illustration shows that one of the three types of charging rheostats listed by this company. The principle of the rheostat is that involving the use of graphite discs which are manufactured subject to a temperature of 7,000 degrees Fahrenheit, and are thereafter tested for mechanical strength. These discs offer a high resistance to electricity, and the amount of this resistance is varied by altering the contact condition between discs by changes in pressure. The device is very simple and owing to the high temperature which obtains during the manufacture of the resistance units it is scarcely to be supposed that overheating will take place during the use of the rheostat. Temperature is kept down by having the units open to air currents and under ordinary charging conditions it is plain that the temperature does not elevate to a point that is worthy of notice. These charging units are of the greatest importance to the man who owns an electric vehicle and who wishes to charge the same in his own garage, and they are also made in the several forms which facilitate their use in connection with charging boards in central station work.

PORTLAND REPAIRMAN'S COUCH

Referring to Fig. 3 of the Portland Repairman's Couch as manufactured by the Spear Auto Company of Portland, Me., it will be observed that it is a substantially constructed platform with four castors fastened to the cross-members and so arranged as to avoid eating up much of the headroom under the automobile where this repairman's couch is adapted for use. The head of the couch is provided with an adjustable cushion so that the operator is enabled to change the headrest to suit the varying conditions, and it is claimed for this couch that it very materially facilitates the repairman's work, thus earning the cost of it perhaps within a week.

HAZARD GEAR-SHIFTING LEVERS

Among the accessories as manufactured by the Hazard Motor Mfg. Co., of Rochester, N. Y., a complete line of gear-shifting lever sets occupies a prominent place,

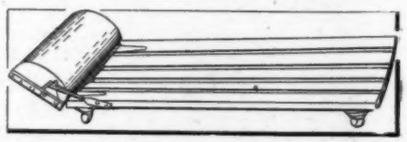


Fig. 3—Making easy work under a car

and Fig. 4 is an illustration of the unit method of assembling the gear shifting and emergency brake levers, including the connecting details so that the unit may be assembled separately and then applied to the automobile on which it is intended to go. The various designs of the Hazard company are in keeping with the structural requirements of the various makers of automobiles, and among the selective hand-control sets available is one, for instance, which is adapted for use in connection with rear axle transmissions. The company states: "Our controls are made from malleable steel castings, the handles being heavily brass plated and polished. We can also furnish the controls cast in solid manganese bronze and highly polished." The outfits are furnished complete including shafting tubes and brake-shafts, ready to be bolted to the chassis frame.

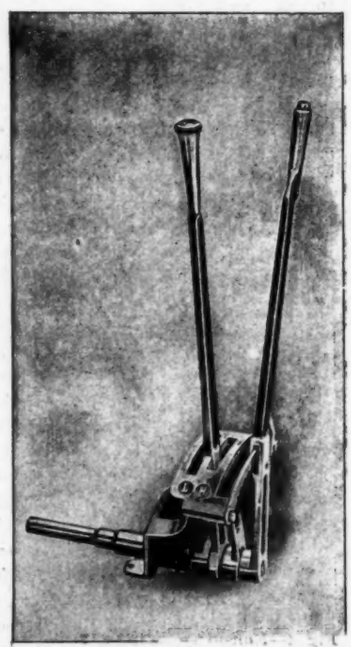


Fig. 4—The Hazard gear-shifting levers